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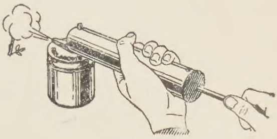

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Noble (N. S.). **An Egg Parasite of the green Vegetable Bug.**—*Agric. Gaz. N.S.W.* **48** pt. 6 pp. 337–341, 5 figs. Sydney, June 1937.

In the summer of 1935–36, supplies of the Scelionid, *Microphanurus basalis*, Wollaston (*megacephalus*, Ashm.), were obtained from Western Australia [*cf. R.A.E.*, *A* **22** 446] for the control of *Nezara viridula*, L., in New South Wales, where it is a serious pest of beans, tomato and other crops. All stages of the parasite are described. For oviposition, females were given egg-masses of the bug glued on cards, and these cards were used for release. In the summers of 1935–36 and 1936–37, about 25,000 and 26,000 parasites, respectively, were liberated ; in one coastal district they were recovered after having overwintered in the field. The males emerge first from any parasitised egg-mass, and the females are fertilised as soon as they appear. The eggs may be laid within a few hours and are deposited in host eggs in all stages of development, but the parasites survive only when the eggs are laid in host eggs that have not yet turned pink. Multiple parasitism frequently occurs, but only one larva completes its development. Pupation takes place within the egg, and the adult eats its way out through a hole in the operculum ; it is unable to turn within the egg, and if those in the breeding cages were glued to the cards with the operculum downwards, the adults could not emerge and died.

The length of the life-cycle at 20–23, 25–26 and 30°C. [68–73·4, 77–78·8 and 86°F.] averaged 23·53, 12·36 and 10·27 days, respectively. With life-cycles of 14 days under laboratory conditions and 7–9 days at a constant temperature of 30°C., the egg stage lasted 20–22 and under 16 hours, the larval stage 4·5–5 and rather more than 2 days, the prepupal stage 2 days and rather more than 1, and the pupal stage 6 and 3–4 days, respectively. The average progeny per female of 6 females observed was 69, and 3 unfertilised females produced a total of 124 males. Ovipositing females usually lived for less than 2 weeks in summer, but adults were kept alive for 2 months at 10°C. [50°F.]. In 1936, they lived in the insectary from March to mid-August, 3 weeks before *N. viridula* began to oviposit, suggesting that normally they can overwinter as adults.

In experiments on the storage of the immature stages, batches of 200 Pentatomid eggs, containing, respectively, newly-deposited parasite eggs, first-stage larvae, mature larvae and young pupae, were exposed for 18 and 30 days to a constant temperature of 10°C. Adults emerged only from those containing first-stage larvae at the time of storage. Many of the pupae and mature larvae reached the adult stage but were unable to emerge, while newly-deposited eggs did not develop.

M. megacephala has been recovered in the field from the eggs of *Agonoscelis rutila*, F., and *Cuspicona* sp., as well as *N. viridula*. It has also been successfully reared, under laboratory conditions, in those of *Biprorulus bibax*, Bredd., the progeny being particularly large.

Insect Pests and their Control.—*Agric. Gaz. N.S.W.* **48** pt. 6 pp. 342–346 8 figs. Sydney, 1st June 1937.

This part of a series on insect pests in New South Wales [*cf. R.A.E.*, A **25** 379] includes a record of the weevil, *Asynonychus godmani*, Crotch, attacking *Citrus* and other plants [*cf.* **22** 658].

NG (Yuk Chau). **Notes on the Life History of *Prodenia littoralis* Boisd. (Lep., Noctuidae).**—*Lingnan Sci. J.* **16** no. 2 pp. 261–266, 1 pl., 3 refs. Canton, 21st June 1937.

The distribution of *Prodenia litura*, F. (*littoralis*, Boisd.) is reviewed, and a list is given of its food-plants in various countries. It occurs in Canton on castor [*Ricinus communis*] and taro [*Colocasia*]. In captivity, fourth-instar larvae accepted 24 other food-plants and subsequently matured to the adult stage. In the case of larvae fed on six of the plants, including onion, carrot and radish, the period spent in the soil before the emergence of the adults was 17 days, the minimum normal period. Brief descriptions are given of all stages, together with the head measurements of the 5 larval instars. Eggs are laid on the underside of the leaves in clusters ranging from 213 to over 300, and hatch in 6–8 days. The larval stage comprises five instars, the first of which may last up to 25 days in cold weather; the last four occupy 3–6, 2–6, 2–6, and 4–6 days, respectively. The period (including the pupal stage) spent in the soil before the adults emerge is 17–28 days.

FU (S. P.). **The Relation between the Height of Cutting of late Rice and Paddy-borer and Rice Cutworm Control.** [*In Chinese.*]—*Insekto interesa* **2** no. 2 pp. 12–19; no. 3 pp. 9–16. Nantung, 1936. (Abstr. in *Lingnan Sci. J.* **16** no. 2 p. 334. Canton, 21st June 1937.)

Brief accounts are given of the life-histories of *Schoenobius bipunctifer*, Wlk. (*incertellus*, Wlk.), *Melanchra* sp., and *Cirphis unipuncta*, Haw., which are the most destructive pests of rice in Kwangtung. By cutting late rice at ground level, the infestation of rice in the following season by *C. unipuncta* and *S. bipunctifer* was reduced by 98 and 85 per cent., respectively.

LAI (K. C.). **Notes on the Parasite, *Trichogramma evanescens* Westw. of the Sugar-cane borer (*Diatraea* sp.) in Kwangtung.** [*In Chinese.*]—*Problem of Insects* **2** no. 1–2 pp. 2–3. 1937. (Abstr. in *Lingnan Sci. J.* **16** no. 2 p. 347. Canton, 21st June 1937.)

Trichogramma evanescens, Westw., was found to parasitise 40–70 per cent. of the eggs of *Diatraea* sp. on sugar-cane in Kwangtung. In the spring of 1937 it was reared for release against the first generation of the borers. Notes are given on the oviposition and longevity of the parasite.

SIEH (Kun). **Preliminary Study on Sweet Potato Moth (*Theretra japonica*, De l'Orza).** [*In Chinese*].—*Insekto interesa* **2** no. 2 pp. 20–22, 1 pl. Nantung, 1936. (Abstr. in *Lingnan Sci. J.* **16** no. 2 p. 363. Canton, 21st June 1937.)

A brief account is given of the bionomics of the Sphingid, *Theretra japonica*, Orza, a serious pest of sweet potato in China. Control measures suggested include hand-collection and cultivation to destroy the pupae in the soil.

WANG (Fei-pang). **Biology of the Citrus Leaf Miner,** *Podagricomela nigricollis* **Chen (Col.) in Hwangyen.** [*In Chinese.*]—*Ent. & Phytopath.* **5** no. 2 pp. 20–28. Hangchow, 1937. (Abstr. in *Lingnan Sci. J.* **16** no. 2 p. 374. Canton, 21st June 1937.)

In parts of Chekiang and Kwangtung the Halticid, *Podagricomela nigricollis*, Chen, attacks various species of *Citrus* and also *Poncirus trifoliata*. The life-cycle is short ; oviposition occurs in April and early May, and the larvae mine in the leaves. The new adults emerge in late May to mid-June, feed for a time on the underside of the tender leaves and shoots, and then aestivate and hibernate underground to appear again the next year. Control measures recommended include hand-picking the eggs and larvae and clean cultivation.

YANG (H. J.). **Biological Notes on** *Acrida turrita* **L. (Orth. Locustidae).** [*In Chinese.*]—*Ent. & Phytopath.* **5** no. 7 pp. 123–125. Hangchow, 1937. (Abstr. in *Lingnan Sci. J.* **16** no. 2 p. 380. Canton, 21st June 1937.)

A brief account is given of the bionomics of *Acrida turrita*, L., in Chekiang. It attacks almost all kinds of graminaceous plants and causes serious injury to the stems and leaves of rice, to which it is as destructive as *Oxya chinensis*, Thnb., or *Hieroglyphus annulicornis*, Shir.

YU (C. T.). **Study of Life-history of a certain Sphinx Moth.** [*In Chinese.*]—*Insekto interesa* **2** no. 4 pp. 1–16, 1 pl. Nantung, 1936. (Abstr. in *Lingnan Sci. J.* **16** no. 2 p. 382. Canton, 21st June 1937.)

A detailed account is given of the life-history of *Smerinthus planus*, Wlk., on willow in China. Adults emerge from overwintered pupae and oviposit in late April, after a preoviposition period of about 24 hours. Larvae hatch in 4–9 days and after 4–5 moults enter the soil, where they complete the pupal stage in 11–20 days. There are 4 generations in the year, and larvae are found from May to September. Light-traps are recommended against the adults, and the soil round the trees should be raked to destroy the pupae.

YU (C. T.). **Antaua Studo de Persik-kalandro,** *Rhynchites heros* **Roelofs.** [Study on the Peach Weevil, *R. heros*.] [*In Chinese.*]—*Insekto interesa* **1** no. 2–3 pp. 43–51, 1 fig. Nantung, 1936. (Abstr. in *Lingnan Sci. J.* **16** no. 2 p. 382. Canton, 21st June 1937.)

Descriptions are given of all stages of *Rhynchites heros*, Roel., which infests peaches in China. Control methods recommended are enclosing the fruits in bags, destroying fallen fruit, jarring the weevils from the trees on to paper covered with an adhesive, and stirring the soil near the trees to destroy the larvae and pupae.

MUNGOMERY (R. W.). **Progress Report of Sugar Cane Beetle Investigations in North Queensland.**—*Proc. Qd Soc. Sug. Cane Tech.* **8** pp. 49–62, 5 figs., 2 refs. [Mackay] 1937.

This is a preliminary account of an investigation on the factors concerned in the severe infestation of sugar-cane by *Rhabdocnemis obscura*, Boisd., that has occurred for some years in the wetter areas of north Queensland, where up to 20 per cent. of sticks were damaged by the weevil in some districts in 1935. It has been suggested that it maintains itself between crops of sugar-cane by breeding in native plants, but it has not been observed on banana in Queensland, and though its cocoons have been recovered from the palm, *Archontophoenix alexandrae*, the length of its adult life renders an alternative host unnecessary. Moreover, some of the worst cases of infestation have occurred in cane-fields in the centre of cleared areas. The investigation showed that weevils sheltering behind leaf-sheaths fall to the ground with the trash when the canes are harvested green, and breed among the damp leaves, ovipositing in the cut ends of cane-tops and exposed stools. Shaving all stubble, in which borers develop in about 3 months, might eliminate breeding in the stools. The number of borers maturing in cane-tops under average conditions is 3–7; cannibalism occurs where oviposition has been heavy.

The effect of burning the trash after harvest varies with the dryness of the cane-tops. Early in the season (June–August), when periods of rain are not infrequent, it does not dispose of all residue, and gives a total mortality of 10–20 per cent., the pupal mortality being about 50 per cent. If, as is usual, the débris is then raked into lanes 5–6 rows apart, it packs down and forms a good breeding-ground for the borers. In one field thus treated, it was estimated that there were 3,000 adult weevils, 8,000 pupae and 42,000 larvae per acre. In another, similarly infested after the initial burning, the trash was raked into every second row and burnt again; burning was then more thorough, and almost all the borers were destroyed.

Pre-harvest burning appeared to be effective against weevils behind leaf-sheaths and in cracks in canes; it destroyed about 76 per cent. of the population in a field fired in August, the small numbers remaining in the residue and stools dying out after 2 months owing to desiccation. Such residue should not be raked up, unless a second burning is intended, but left to dry. This method might prove effective if applied over large areas, but it possibly involves some deterioration of cane-juices, and deprives the soil of much organic matter that would be added to it by trash-conservation.

Where ratooning is practised, the trash is often raked into every second row and left to rot. As the tops dry out, most eggs, larvae and pupae in them die through desiccation. Such trash-conservation does not increase the weevil population, and it has for 6 years been more satisfactory than post-harvest burning. Large populations may be built up, however, if the trash contains a high proportion of discarded cane, and pre-harvest burning is then advocated, or infested cane should be dumped in water-courses.

In places where planting is carried out by placing whole sticks of cane in the drills and then chopping them into the requisite lengths, it is impossible to avoid the use of infested canes and fields may have an initial population of 1,000–2,000 borers per acre for this reason.

Investigations of the resistance of different varieties of cane, which is correlated with the hardness of the rind [*cf. R.A.E.*, A **25** 315, etc.], showed that in two trials the percentage infestation of Q2 and Badila was 5 and 38, and 0 and 52, respectively.

BUZACOTT (J. H.). **Rind Hardness Determinations as an Aid in Beetle Borer Control.**—*Proc. Qd Soc. Sug. Cane Tech.* **8** pp. 143–152, 5 figs. [Mackay] 1937.

A machine that shows on a scale the force required to drive a standard needle through the rind of sugar-cane has been constructed to test rind hardness, as this is correlated with resistance to attack by the sugar-cane borer [*Rhabdocnemis obscura*, Boisd.] in Queensland. The results of tests on a number of varieties are given in tables and graphs. In the varieties tested, the softest part of the rind occurred about midway between adjacent nodes. Owing to the variation in readings from node to node, 20 punctures, in the centre of the internodes, made throughout the entire length of the stick were necessary to give the degree of significance required for placing the canes in 4 grades of susceptibility.

New varieties to be tested should be grown beside standard varieties, and under identical conditions, as rind hardness varies considerably with age, conditions of growth, lodging, trashing, trash-binding, and probably other factors, such as manurial treatments. Readings were noticeably more erratic in sticks that had lodged, suggesting that rind hardness is less when the cane is in contact with the ground or where it has become trash-covered. That trash-bound Badila cane is softer than normal Badila indicates that artificial trashing tends to increase hardness of rind, and experiments are being carried out to test this. On the basis of tests with the machine, Badila is one of the most susceptible varieties to borer attack, and Q2 one of the most resistant, and this classification has been accurately confirmed by field counts [*cf.* preceding paper].

O'CONNOR (B. A.). **Progress of Work on *Sexava* spp., the Coco-nut Treehopper.**—*New Guinea agric. Gaz.* **3** no. 1 pp. 1–4. Rabaul, April 1937.

An account is given of further work on the bionomics and control of *Sexava* spp. infesting coconuts in the Territory of New Guinea [*cf. R.A.E.*, A **24** 201]. The author states that he is unable to distinguish between *S. novae-guineae*, Brancsik, and *S. nubila*, Stål, which, according to previous records, are both present in New Hanover, while only the former occurs in Manus. In the latter island, however, about two-thirds of the males had 7 nymphal instars, like the females, the rest having only 6. Pairing and oviposition appear not to take place until 10 and 33 days, respectively, after the females have reached maturity. The duration of nymphal development was slightly longer than under laboratory conditions in New Hanover [*loc. cit.*], where the temperature was rather high, but it is probable that under field conditions it lasts for about a month longer there than in Manus. Under comparable conditions in Manus and New Hanover, the incubation period averaged 51 and 61·8 days, respectively.

Parasites of *Sexava* are well established in New Hanover [*loc. cit.*] and appear to be successful in keeping infestation there at a low level. Attempts have therefore been made to introduce them into other islands. The Encyrtid, *Leefmansia bicolor*, Wtstn., has become established in New Britain, and small numbers of the Trichogrammatid, *Doirania leefmansi*, Wtstn., were liberated there but failed to become established. About 1,000,000 *Sexava* eggs, 78 and 22 per cent. of which were parasitised by *D. leefmansi* and a Mymarid, respectively, were transferred from New Hanover to Manus, but the results are not yet known.

Under laboratory conditions in Manus, all individuals of *Sexava* feeding on coconut leaves sprayed with lead arsenate (½ or 1 oz. in 1 gal. water) died within 3–5 days.

[FROGGATT (J. L.).] **Report of the Entomologist. Year ended 30th June, 1936.**—*New Guinea agric. Gaz.* **3** no. 1 pp. 8–10. Rabaul, April 1937.

Work on the parasites of *Sexava* in the Territory of New Guinea is briefly reviewed [see preceding paper]. Other pests observed on coconuts in various localities were *Promecotheca papuana*, Csiki (*antiqua*, Wse.), *Tirathaba rufivena*, Wlk., and *Sparganobasis subcruciata*, Mshl. [*cf. R.A.E.*, A **24** 466; **25** 451].

DWYER (R. E. P.). **The Diseases of Coco-nuts** (*Cocos nucifera*) **in New Guinea.**—*New Guinea agric. Gaz.* **3** no. 1 pp. 28–93, 16 figs., 86 refs. Rabaul, April 1937.

This account of the diseases of coconuts in the Territory of New Guinea includes a section (pp. 58–70) dealing with nutfall, introduced by a lengthy review of the literature [*cf. R.A.E.*, A **24** 328, 568, etc.]. Work by J. L. Froggatt on Tabar Island showed that although an occurrence of nutfall was associated with the Pentatomid, *Axiagastus cambelli*, Dist., and the spathe borer, *Tirathaba rufivena*, Wlk., the nuts fell during a dry spell after heavy rains, and the trees recovered after 6–9 months. The soils in the affected plantation were hard, red and clayey, and on the flats where nutfall had been apparent before, the bases of the palms were very exposed and the ground compacted, especially where cattle had been grazing. Such soils dry up and crack during dry periods. The presence of seedy grass (*Chrysopogon aciculatus*) was also very detrimental to the palms. There is very little nutfall from healthy palms on a narrow coral and sandy belt of the foreshore.

T. rufivena was bred from material collected from areas where nutfall occurred on Kar Kar Island, New Britain, New Ireland and New Hanover, and *Sexava* spp. and *Promecotheca* [*papuana*, Csiki], when very abundant, caused a considerable amount of immature nutfall. The infested fronds die and fall prematurely and the area of leaf surface is greatly reduced, so that the palms are weakened and the nuts unable to ripen. In one plantation in New Britain where there was a heavy infestation of *Promecotheca*, nuts of all stages fell singly and whole spathes of green nuts fell together. In parts of a plantation in New Hanover, palms were very heavily infested by *A. cambelli*, which destroyed the flowers and caused the young nuts to fall in large quantities, but this Pentatomid has not brought about serious damage elsewhere in the Territory. *Amblypelta cocophaga*, China, which is associated with nutfall in the Solomon Islands, is possibly present in Bougainville Island, but has not been recorded in the Territory of New Guinea. Allied Coreids, however, apparently occur in various parts of the Territory.

In a small area in Bougainville Island, nutfall was associated with unfavourable soil conditions. A small unidentified borer was present in the base of some of the coconuts, but if insects were the primary cause of the condition, it is difficult to understand why it should have been so localised.

On the mainland of New Guinea, nutfall has recently become severe in an old plantation where four conditions likely to cause it were fungus and insect attack, soil and cultural conditions, age of the palms leading to soil exhaustion, and climatic conditions. The fungus, *Thielaviopsis paradoxa*, which has been recorded as causing nutfall in Porto Rico, was present, together with other fungi that appeared to be secondary in their effect. *Tirathaba rufivena* was also present, but several spathes from which the nuts had fallen showed no signs of disease or of insect attack. After examining fallen nuts from the mainland, J. S. Phillips stated that nutfall there did not result from the same factors as in the Solomon Islands, where the palms and foliage were generally healthy, suggesting that the causes were not physiological.

CARTER (W.). **The Toxic Dose of Mealy-bug Wilt of Pineapple.**—*Phytopathology* **27** no. 10 pp. 971–981, 3 refs. Lancaster, Pa, October 1937.

An account is given of experiments in Hawaii in 1933–36 on the relation between the numbers of *Pseudococcus brevipes*, Ckll., on pineapple plants and the incidence of pineapple wilt [*cf. R.A.E.*, A **21** 64; **23** 641]. It was found that, for any given set of conditions, the percentage of wilting plants increased with increasing numbers of mealybugs, but that the ratio of wilt percentage to the number of mealybugs was not constant. There was usually a point in the scale of infestation that brought a disproportionate rise in wilt percentage; increased infestation beyond this point resulted in only a small rise. No two experimental series at different seasons yielded the same percentages of wilt following the application of similar numbers of mealybugs. `It was evident that mealybug toxicity and plant susceptibility are both extremely variable. Establishment of the mealybugs on the plants and, therefore, the amount of feeding, varied within wide limits, which may be interpreted as largely a matter of plant suitability. The variable of plant susceptibility is extremely important. Even when apparently uniform planting material is used, there is considerable variation in growth and succulence. Moreover, comparison of experiments suggested strongly that susceptibility may be due to a specific and perhaps transient state of the plant at the time of infestation. The possible contribution of a soil complex and its influence on the plant's susceptibility have been repeatedly suggested by the localised incidence of wilt in experimental plots. The localised establishment of mealybugs may account for localisation of wilt incidence, but such establishment is still an unexplained phenomenon of the micro-environment.

BARNES (H. F.). **Check List of the Cecidomyidae of Oceania.**—*Occ. Pap. Bishop Mus.* **13** no. 6 pp. 61–66, 21 refs. Honolulu, 1937.

This list comprises the species recorded from Samoa and Hawaii. The Hawaian records include *Contarinia maculipennis*, Felt (hibiscus bud midge), *C. sorghicola*, Coq., which infests the heads of *Sorghum*, preventing seed formation, *C. solani*, Rübs. (which in the author's opinion was erroneously identified and is in fact *C. lycopersici*, Felt) from tomato buds, *Phaenobremia meridionalis*, Felt, which is predacious on the sugar-cane Aphid [*Aphis sacchari*, Zehnt.], and *Lobodiplosis pseudococci*, Felt, which was introduced from Mexico in 1930 [*cf. R.A.E.*, A **24** 176, etc.] and is predacious on the pineapple mealybug [*Pseudococcus brevipes*, Ckll.].

Mori (N.). **On the Sugar-cane Beetle Borer.** [*In Japanese.*]—*Bot. & Zool.* **5** no. 6 pp. 1217–1218. Tokyo, June 1937.

Rhabdocnemis obscura, Boisd., occurs on sugar-cane in the Bonin Islands and the Pacific Islands under Japanese mandate, but has not been observed in Formosa. A description of the weevil is given, with brief notes from the literature on its bionomics.

Mori (N.). **On the Host Plants of Red Wax Scale** (*Ceroplastes rubens* **Mask.**). [*In Japanese.*]—*Bot. & Zool.* **5** no. 9 pp. 1744–1745. Tokyo, September 1937.

This paper comprises a brief list of the plants on which *Ceroplastes rubens*, Mask., has been observed by the author.

Compendium of injurious Insects of Agricultural Plants in Formosa, 3. [*In Japanese.*]—*Publ. Bur. Industr. Formosa*, no. 787, 229 pp., 21 col. pls., 18 figs. Taihoku, Formosa, June 1937.

In this third paper of a series [*cf. R.A.E.*, A **22** 520], over 380 species of insects attacking sugar-cane, cotton, tea, tobacco, ramie [*Boehmeria nivea*], mulberry and certain other crops, are briefly described, and notes are given on their bionomics and control.

Fukuda (K.). **Control Experiments with Insect Pests of Cotton.** [*In Japanese.*]—*Formosan agric. Rev.* **33** no. 6 pp. 1–28. Taihoku, Formosa, June 1937.

The chief insect pests of cotton in Formosa [*cf. R.A.E.*, A **25** 228] include *Empoasca* (*Chlorita*) *biguttula*, Mats., which is abundant from mid-August, *Dysdercus cingulatus*, F. (*megalopygus*, Breddin), *Sylepta derogata*, F., and *Earias fabia*, Stoll., which sometimes injures 24–73 per cent. of the bolls. A termite and *Brachytrypes portentosus*, Licht., cause severe damage occasionally. Sprays of pyrethrum and soap [*cf.* **25** 229] or petroleum oil emulsion, which causes some injury to plants, are effective against the nymphs of *E. biguttula*, but only slightly so against the eggs and adults. Spraying with lead arsenate controls *S. derogata* and *Cosmophila* (*Anomis*) *flava fimbriago*, Steph., but derris is less effective. Sprayed plants appear to open their bolls later than others and yield a much larger crop.

Nakatsuji (K.). **On Mites on Lily in Izu.** [*In Japanese.*]—*Oyo-Dobuts. Zasshi* **9** nos. 3–4 pp. 137–139. Tokyo, August 1937.

The mites, *Gamasellus* sp., *Uropoda* sp., *Rhizoglyphus echinopus*, F. & R., *Epicroseius* sp. and *Maorichthonius* sp. have been observed in lily bulbs in Izu, near Tokyo. The last two were predacious on the others.

Sasaki (I.). **Coccidae in Plant Inspection Work.** [*In Japanese.*]—*Oyo-Dobuts. Zasshi* **9** no. 3–4 pp. 141–148. Tokyo, August 1937.

Coccids represent 90 per cent. of the insects intercepted at plant quarantine stations in Japan and in 1935 were observed 480 times on imported plants at Kobe alone. A list is given of the species collected; they include *Prontaspis yanonensis*, Kuw., on *Citrus* from North

America, *Parlatoria mangiferae*, Marl., on orchids from Malaya, and *Aspidiotus biprominens*, Kuw., on orchids and *Chionaspis javanensis*, Kuw., on a palm, both from the Netherlands Indies.

KAMIYA (K.). **Oviposition Habits of Scarabaeidae.** [*In Japanese.*]—*Oyo-Dobuts. Zasshi* **9** no. 3–4 pp. 149–150. Tokyo, August 1937.

Observations in Japan showed that *Anomala rufocuprea*, Motsch., laid the great majority of its eggs between 6 and 12 p.m. Most of the eggs were found at a depth of 2–4 ins. in the soil, the numbers decreasing at 4–6, 0–2 and 6–8 ins., in that order.

SUENAGA (H.). **On Aphids attacking the Roots of Rice.** [*In Japanese.*]—*Oyo-Dobuts. Zasshi* **9** no. 3–4 pp. 150–152. Tokyo, August 1937.

In Japan, the following three Aphids attack the roots of dry-cultivated rice : *Anoecia corni*, F., which migrates to rice and other grasses from late May onwards and returns to *Cornus* between mid-September and early December ; *Rhopalosiphum prunifoliae*, Fitch, which occurs on rice from late June and appears above ground from late August ; and *Byrsocrypta gallarum*, Gmel. (*Tetraneura ulmi*, DeG.), of which the author considers *B.* (*T.*) *akinire*, Sasaki, *B. gallarum yezoensis*, Mats. (*T. yezoensis*), *B.* (*T.*) *fusiformis*, Mats., *B.* (*T.*) *hirsuta*, Baker, and *Gobaishia nirecola*, Mats., to be synonyms, and which is found on rice from May to September. *B.* (*T.*) *radicicola*, Strand, infests the roots of a wild grass, but not rice.

KISHIDA (K.) & KATSUMATA (K.). **On** *Eriophyes* **on Plum.** [*In Japanese.*]—*Oyo-Dobuts. Zasshi* **9** no. 3–4 pp. 153–154, 1 fig. Tokyo, August 1937.

Descriptions are given of two undetermined Eriophyid mites that attack the leaves of plum in Japan.

FUKUDA (J.). **Respiration of** *Calandra oryzae* **L. in Relation to the Volume of Chloropicrin for Fumigation.** [*In Japanese.*]—*Oyo-Dobuts. Zasshi* **9** no. 3–4 pp. 162–164, 7 figs. Tokyo, August 1937.

In experiments in Japan, the oxygen consumption of the rice weevil, *Calandra oryzae*, L., increased with the temperature up to 30°C. [86°F.], though the rate of increase was relatively small above 26°C. [78·8°F.], and decreased at higher temperatures. The effectiveness of chloropicrin as a fumigant against it increased with the temperature up to 30°C., but decreased at 35°C. [95°F.].

TSUTSUI (K.). **Some natural Enemies found when rearing** *Ephestia cautella* **Walk.** [*In Japanese.*]—*Oyo-Dobuts. Zasshi* **9** no. 3–4 pp. 165–166. Tokyo, August 1937.

While *Ephestia cautella*, Wlk., was being reared in Japan to obtain host eggs for *Trichogramma japonicum*, Ashm. [see next paper], the larvae were sometimes attacked by *Tyroglyphus* sp. and by the spider, *Theridion tepidariorum*, Koch, and were parasitised by *Microbracon* (*Habrobracon*) *hebetor*, Say, and an Ichneumonid of the genus *Cremastus*, of which the former was the more important.

HAMA (T.). **Cold Storage of the Eggs of** *Ephestia cautella* **Walk. and** *Trichogramma japonicum* **Ashm.** [*In Japanese.*]—*Oyo-Dobuts. Zasshi* **9** no. 3–4 pp. 169–172. Tokyo, August 1937.

Trichogramma japonicum, Ashm., an effective egg-parasite of the rice borer, *Chilo simplex,* Btlr., in Japan, is reared in numbers in the eggs of *Ephestia cautella,* Wlk. As the oviposition period of the parasite lasts only 1 or 2 days and it completes five generations to one of the host, while young host eggs are the most suitable for parasitism [*cf. R.A.E.*, A **25** 335] it may be necessary to keep the latter in cold storage. Eggs about 20 hours old are suitable for cold storage, and those 22 hours old are satisfactory host material after being stored at 8°C. [46·4°F.] for over a month, though they do not hatch after two weeks' exposure. Cold storage of parasitised eggs greatly reduces the percentage of adult parasites that emerge and their fecundity.

SAWA (R.). **Control of** *Chilo simplex* **Butl. by Irrigation in Winter.** [*In Japanese.*]—*Oyo-Dobuts. Zasshi* **9** no. 3–4 pp. 175–178, 1 fig. Tokyo, August 1937.

It has been found in Japan that larvae of *Chilo simplex,* Btlr., hibernating in rice stubble are destroyed by flooding the fields for 10 days.

YUASA (H.). **Notes on Cecidomyiids attacking Wheat.** [*In Japanese.*] —*Oyo-Dobuts. Zasshi* **9** no. 3–4 pp. 180–184, 2 figs. Tokyo, August 1937.

In addition to *Sitodiplosis mosellana,* Géh., two undetermined Cecidomyiids have been observed attacking wheat in Japan. Characters distinguishing the larvae of these species are enumerated.

NAKAYAMA (S.). **On the Food Habits of** *Ephestia elutella* **Hübner.** [*In Japanese.*]—*Oyo-Dobuts. Zasshi* **9** no. 3–4 pp. 190–191. Tokyo, August 1937.

In Korea, larvae of *Ephestia elutella,* Hb., attack tobacco leaves in storehouses, preferring those with considerable moisture or sugar contents, and feed along the mid-ribs from the base. In experiments, they also fed on hulled, but not unhulled, rice.

WOO (S. S.) & TSUI (P. C.). **Une observation sur les insectes nuisibles aux betteraves à sucre dans la province du Shan-Tong.** [*In Chinese.*]—*Spec. Publ. nat. agric. Res. Bur. China* no. 17, 44 pp., 17 figs., 14 refs. Nanking, April 1937. (With a Summary in French.)

In 1936, a survey of insects injurious to sugar-beet in Shantung Province was begun. There was a minimum loss of weight of 10 per cent. of the crop resulting from injury to the leaves by the Pyralid, *Hymenia recurvalis,* F. (*Zinckenia fascialis,* Stoll), and the Noctuids, *Barathra brassicae,* L., and *Prodenia litura,* F. All these Lepidoptera also attack other plants, have 2–3 generations a year, and hibernate as pupae in the soil at a depth of 2–4 inches. Coleoptera infesting leaves of beet as well as other crops include the adults of the Meloids, *Epicauta gorhami,* Mars., and *E. formosensis,* Wellm., and the larvae and adults of the Chrysomelids, *Colaphellus bowringi,* Baly, and

Phaedon brassicae, Baly. The Meloids have one generation annually and hibernate as larvae or prepupae in the soil at a depth of 2–4 inches. The Chrysomelids overwinter as adults in cultivated soil and have 2 generations a year. A Homopterous insect caused spotting and ultimate withering of the leaves, and the young leaves and shoots were also attacked, though not severely, by the Pentatomids, *Halyomorpha picus,* F., *Erthesina fullo,* Thnb., and *Dolycoris baccarum,* L., and the Capsid, *Adelphocoris variabilis,* Uhl.

Control measures comprise the burning of leaves and other débris beneath which hibernation occurs, ploughing to expose insects hibernating in the soil, and spraying with lead arsenate or calcium arsenate against the Lepidoptera and Coleoptera.

FAJARDO (T. G.) & TECSON (J. P.). **A Report on an Insect Pest of White Amarylli Lily in the Trinidad Valley, Mountain Province, Philippine Islands.**—*Philipp. J. Agric.* **8** no. 1 pp. 61–73, 9 pls., 2 refs. Manila, 1937.

In November 1933, a serious outbreak of *Brithys crini,* F. (*Glottula dominica,* Cram.), which had previously been present in small numbers only, occurred on *Crinum zeylanicum* in the Trinidad Valley, Luzon. It has not been eradicated, but does not appear to have spread to other parts of the Philippine Islands. The larvae first mine the leaves in groups, and then, as they become older, feed voraciously on all the succulent parts of the plant. Bulbs in the field or in storage are also attacked. In the laboratory, the larvae fed readily on *C. zeylanicum* and *C. chinensis,* less so on *C. asiaticum* and slightly or not at all on six other plants. Under laboratory conditions, the average length of development in Manila at a temperature of 28–30°C. [82·4–86°F.] was 34·75 days in November and December 1933 and 32·5 from December 1933 to February 1934 ; in Baguio at a temperature of 17–22°C. [62·6–71·6°F.] it was 61·75 days in February and March and 53·25 in March and April 1935. The various stages are described.

Lead arsenate dust applied to leaves on which larvae were allowed to feed, and Bordeaux mixture and lime-sulphur applied as dusts to the larvae themselves killed them all in 24 hours. Flowers of sulphur applied to the larvae or Bordeaux mixture or lime-sulphur to the leaves had no effect. After 2 hours, larvae fed on leaves sprayed with 0·2, 0·5 and 1 per cent. suspensions of lead arsenate were still alive and continued to feed, while those fed on leaves sprayed with 2 and 5 per cent. suspensions had become sluggish. After 22 hours, 1 and 2 out of the two lots of 5 fed respectively on the leaves sprayed with the 0·2 and 0·5 per cent. suspensions and all those fed on the leaves sprayed with the stronger suspensions were dead. The control larvae were all feeding vigorously at the end of the experiment. Eggs exposed to *Trichogramma minutum,* Riley, in the laboratory failed to hatch, whereas control eggs hatched normally, but when the parasite was liberated it did not become established, on account of the control measures that had already been taken. A fungus caused the death of some larvae in the field and in limited inoculation experiments in the laboratory. Control measures that proved effective were cutting off the infested leaves and burying them to a depth of about 18 ins. or burning them, hand-picking the larvae, digging up the plants, removing the leaves and replanting at a considerable distance, or attracting the adults to torches.

CHERIAN (M. C.), KRISHNASWAMY (P. N.), RAMACHANDRAN (S.) & SUNDARAM (C. V.). **The "Soorai" Disease of Paddy.**—*Madras agric. J.* **23** no. 10 pp. 397–400, 1 pl. Madras, October 1935. [Recd. 1937.]

In the Madras Presidency, a stunted condition of rice plants that results from attack by the Coccid, *Ripersia oryzae*, Green, is known as soorai disease. Infestation occurs under the leaf-sheaths and increases rapidly ; females were observed to lay 126–319 eggs, and the periods of incubation and subsequent development vary from a few minutes to 24 hours, and from 17 to 34 days, respectively. When it is severe, the earheads may become smothered and unable to emerge from the sheath. The greatest number of individuals observed on a plant was 596. Infestation of different varieties of rice reduced the yield of grain in gm. per 100 plants from 727, 678 and 606 to 140, 190, and 173, respectively, in crops of long duration and from 607 and 469 to 241 and 193 in crops of short duration. A list is given of the many different graminaceous and cyperaceous plants that are alternative food-plants. The Coccids spread from these to the nurseries, which are regarded as the chief source of infestation of the rice-fields.

As heaping the seedlings beneath wet gunny bags for 5 days and manurial and varietal tests offered no prospect of control, affected seedlings should be pulled out and burnt as soon as infestation appears.

CHERIAN (M. C.) & ANANTANARAYANAN (K. P.). **Notes on the Incidence of the Swarming Caterpillar of Paddy.**—*Madras agric J.* **25** no. 2 pp. 45–49. Madras, February 1937.

Spodoptera mauritia, Boisd., is a serious pest of young rice in South India. Eggs are laid in masses of 15–20 on the tender shoots and hatch in 3–5 days. The larvae feed on the rice for 3–5 weeks, moving from field to field in swarms, but doing visible damage only when nearly mature. The pupal period of 10 days is passed in the soil, and the adults generally seek suitable food-plants for oviposition at a distance, as those in the locality are too old. As *S. mauritia* is present in the rice-fields of Madras almost throughout the year, serious outbreaks may develop whenever conditions of weather and crop become favourable. In places where infestation occurs annually, injury is least when the plants are grown in a dry-sown nursery and transplanted [*cf.* *R.A.E.*, A **23** 732]. An invasion of moths is often preceded by the gradual cessation of the wind, followed by a calm and than a change in the direction, the absence of a continuous or strong wind, and hot, sunny days with humid, sultry nights. During 1935, 5 separate batches of moths arrived during one month, and in 1936, 4 batches appeared in the same time. Oviposition only occurs at night, the moths hiding by day. Where the soil in the fields was very swampy, large numbers of eggs were laid on plants growing on the bunds. The larvae moved to other plants by means of silken threads. When rice plants on the bunds were used as traps, 60–70 egg-masses were collected from each.

CHERIAN (M. C.) & MAHADEVAN (V.). **A new Enemy of the Indian Honey Bee.**—*Madras agric. J.* **25** no. 3 pp. 65–67. Madras, March 1937.

A brief account is given of the bionomics of the Sphegid, *Palarus orientalis*, Kohl, which is recorded as predacious on bees (*Apis indica*, F.) in India. The wasp catches the incoming and outgoing bees at the entrance to the hive, and may take 15–20 in a day. If more than one wasp is at work, the loss is considerable, and the routine work of the colony is disturbed. The wasp and its nest should be destroyed; the latter may be located by following the wasp as it returns there with its prey.

KLEIN (H. Z.). **Contributions to the Knowledge of the Red Spiders in Palestine. I. The Oriental Red Spider,** *Anychus orientalis* **Zacher.**—*Bull. agric. Res. Sta. Rehovoth* no. 21 pp. 3–36, 12 figs., 10 refs. **II. The Common Red Spider,** *Epitetranychus althaeae* **v. Hanst.**—*T.c.* pp. 37–63, 6 figs., 9 refs. Rehovoth, November 1936. (Repr. from *Hadar* 9.) [Recd. August 1937.]

The first of these papers deals with investigations in 1933–35 on *Anychus orientalis*, Zacher, the most dangerous of the red spiders infesting *Citrus* in Palestine. The course of development of the mite and the principal characters of both sexes in all stages are described. It was reared under natural conditions on young *Citrus* in pots; larvae were placed on the leaves and kept on them by oiled rings round the petioles, and when they reached the adult stage, they were redistributed, only one pair being allowed to each leaf. Several thousands were reared in this way.

In the southern part of the coastal plain, *A. orientalis* produced up to 18 generations a year. The duration of development from egg to adult varied with the temperature, relative humidity having no marked effect. The minimum was 8 days in July when the temperature was 25·8°C. [78·44°F.] and 68 days from December to March at 13°C. [55·4°F.]. The egg stage averaged 35 days at 13°C. and 3·7 days at 24–26°C. [75·2–78·8°F.]. Males and females did not differ greatly or consistently in the period required for subsequent development, though the male goes through two active and two latent stages and the female three. The calculated threshold of development and thermal constant are about 10°C. [50°F.] and 180 [324] day-degrees.

Pairing usually occurs immediately after emergence, but parthenogenetic reproduction, giving rise to male offspring, may occur. At 14–15, 20–22 and 23°C. [57·2–59, 68–71·6 and 73·4°F.], the intervals between reaching maturity and the first oviposition were 4–8, 2·5–3 and 1–2 days. The percentage of males was 29·2 from April to October, but rose to 44 during November. The duration of adult life was about the same in both sexes and varied from a maximum of 12 days in summer to 21 in winter. Females were observed to lay up to 8 eggs in 24 hours, and totals of 18 at 16°C. [60·8°F.], 23 at 19–20°C. [66·2–68°C.] and 35 at 22–27°C. [71·6–80·6°F.]. Mortality during the egg stage was lowest when both temperature and relative humidity were high; mortality in the larval and nymphal stages increased with a fall in temperature, but was not so evidently related to humidity. The percentage mortality during the whole development was 20–40, 50–75 and over 75, when the temperature was 23–27, 19–24 and 13°C., and the relative humidity 62–70, 40–60 and 68–72 per cent., respectively.

In 1933, this mite was reported from lemon in Lower Egypt. Previously it was only known in Palestine, having been numerous for many years in all *Citrus* groves in the Jordan Valley. It now occurs in all parts of the country where *Citrus* is grown. An account is given of its seasonal prevalence in the various zones, together with a graph showing the fluctuations in population in the coastal plain region and in the temperature and humidity there, which demonstrates that intensive multiplication begins with a combined rise of temperature over 18°C. [64·4°F.] and relative humidity above 55 per cent. Another chart shows that the optimum temperatures and relative humidities for different stages and processes of development all fall between 21°C. [69·8°F.] and 27°C. and 59 per cent. and 70 per cent., respectively ; but temperatures as low as 18°C. and a relative humidity as low as 55 per cent. seem to be highly favourable. Conditions within these limits occur from September till December in Jericho, the summer being too dry, from April till November at Deganiyyah near the Lake of Gennesaret and from June till October in the coastal zone.

Besides *Citrus*, the food-plants include *Plumiera alba*, castor (*Ricinus communis*), *Carica papaya*, mulberry (*Morus alba*) and *Ficus macrophylla*. Of all *Citrus* trees, lemon is the most readily attacked. In experiments on artificial infestation of cucumber, egg-plant and beans, on which *A. orientalis* has never been found, the percentages of successful infestations were 6·9, 17·1 and 25, respectively, as against 84 on *Citrus*. Development on cucumber and egg-plant was as rapid as on *Citrus*, but on beans it took slightly longer. In the early years of infestation, a decided preference was shown in the coastal plain for nursery stock and young plantations, but trees of all ages are now attacked indiscriminately. Infested leaves become chlorotic and fall, twigs and branches dry up, fruit falls, and it is possible that blossoming may be affected. Attacks on young trees are sometimes fatal.

The mites are occasionally destroyed by thrips and spiders, and adults and larvae of a Coccinellid of the genus, *Scymnus* feed on all stages, but the latter is very scarce in summer, the time of most rapid increase of *A. orientalis*. In experiments, a rotenone dust and sprays containing rotenone, pyrethrum extract, nicotine or nicotine sulphate did not give satisfactory results, but almost complete mortality was obtained with 1 and 1·5 per cent. emulsions of white oil, and with various sulphur dusts. Wetting the tree immediately before application of sulphur had no effect on the results. The 1·5 per cent. oil emulsion destroyed all the eggs, and though the sulphur did not, its effect lasted long enough to kill all larvae on hatching in summer. The advantages of spraying and dusting are compared. Experience has shown that measures are best applied as soon as infestation begins ; applications of sulphur may have to be repeated 2–5 times during the season, but should be avoided in the hottest months, as scorching of fruit and foliage may result.

In the second paper are recorded investigations carried out during 1932–35 on *Tetranychus telarius*, L. (*Epitetranychus althaeae*, v. Hanst.), which causes the same type of damage to *Citrus* in Palestine as *A. orientalis*. It was reared under natural conditions in the same way as the latter and also on *Citrus* in the laboratory and on beans, egg-plant, cucumber and castor in the laboratory and out of doors. The measurements of each active stage and the colours of the various stages on *Citrus* are given. Reared on *Citrus* under natural conditions, *T. telarius* produced 18 generations from the middle of January to the end of October, but breeding failed during the remaining weeks. As it is known not to hibernate in this region, it is assumed that more than 20 generations are produced annually. The duration of development varied with temperature, relative humidity having no marked effect. The minimum was 9 days in July and August at 26·8°C. [80·24°F.] and 28 days in March and April at 16·8°C. [62·24°F.]. The calculated threshold of development and thermal constant are about 8°C. [46·4°F.] and 170 [306] day-degrees. The egg stage averaged 9·4 days at 12–16°C. [53·2–60·8°F.] and 3·1 days at 24–26°C. The periods required for subsequent development of male and female were practically identical. In the laboratory, where the average monthly temperature was 2–3°C. [3·6–5·4°F.] higher than in the open, development was usually more rapid, but this was not so in February, April, apparently on account of the hot winds, or December. Sunlight had no effect in the laboratory. The most rapid development of one generation in summer on *Citrus*, beans, egg-plants and cucumbers in the laboratory was 7 days, and in the open 9, 8, 8, and 10 days, respectively, and 8 on castor.

The percentage of females was 62·2–68 between April and September, 92 in January and February and 76·5 in March. Pairing begins immediately maturity is reached. In months having temperatures of 24–26, 20–23 and 13–19°C., oviposition began respectively 1, 2 and 3–5 days after the female reached maturity. The duration of adult life is about the same in both sexes; it varied from a maximum of 15 days in summer to 31 in winter, on *Citrus* under natural conditions, and was somewhat longer in the laboratory. In the open in summer, adults lived 24, 18, 14 and 21 days on bean, egg-plant, cucumber and castor, respectively. The average number of eggs laid by a female in one month varied from 2·8 in February to 15 in March. From April to July, oviposition is nearly stable. It falls in autumn, and only a few eggs are laid in winter. In the laboratory, oviposition was highest in autumn and lowest in summer and winter, when it was almost equal. Oviposition on all other food-plants was greater than on *Citrus* under all conditions. It was particularly high on beans. No female was observed to lay more than 3 eggs during 24 hours on *Citrus*, but as many as 7 were laid on vegetables and castor. Mortality of eggs increased greatly with decreasing temperature, and low relative humidity also appears to affect them adversely. Mortality in all other stages increased with a rise of temperature, but the differences were not so marked as in the case of the egg. On *Citrus*, the percentage mortality during the whole development was 42–49 at 22–26°C. and 53–69 per cent. humidity, and 59–60 at 13–19°C. and 47–68 per cent. humidity. In summer, mortality reached 25·8 per cent. on beans and 29·9 per cent. on egg-plant.

T. telarius, the world distribution of which is discussed, apparently occurs throughout Palestine. It is abundant on cultivated plants all the year round in the coastal plain, in spring and autumn in the inland valleys and in summer in the mountains. It is carried by wind and can travel rapidly over a smooth surface. A list is given of its 63 known food-plants in Palestine. They belong to 25 families, and about 60 per cent. are cultivated plants. Those that suffer economic injury include beans, egg-plants, castor, *Citrus*, pears, tomato and cucurbits. Trees were not usually attacked when more than 4 years old. The months of severest infestation of various groups of plants in different parts of the country are given. *T. telarius* is found on *Citrus* in the coastal plain and in spring only, when the wild food-plants have been destroyed by ploughing. When irrigation renews wild plant life, it migrates back to herbaceous plants. Its natural enemies are the same as those of *A. orientalis*. It is controlled by dusting with sulphur or spraying with a white-oil emulsion at 1·5 per cent. Care should be taken that the dust or spray reaches the lower surface of the leaves, and it should be applied immediately the first mites are seen. On vegetables and ornamental plants, two or more applications are necessary.

KLEIN (H. Z.). **On the Biology of the Black Scale** *Chrysomphalus aonidum* **L. in the Jordan Valley.**—*Bull. agric. Res. Sta. Rehovoth* no. 23, 18 pp., 4 figs., 6 refs. Rehovoth, January 1937. (Repr. from *Hadar* **10** no. 1.) [Recd. August 1937.]

In the Jordan Valley, the black scale, *Chrysomphalus ficus*, Ashm. (*aonidum*, auct.), has 4–5 generations a year on *Citrus* [*cf. R.A.E.*, A **25** 257]. The young larvae appear in February, May, July, September and November, unless the winter is very cold, in which case there is no February generation. The length of development varies according to temperature and humidity. The calculated threshold of development and thermal constant for the complete life-cycle are, respectively, about 10·6°C. [51·08°F.], and 924 [1663·2] day-degrees. Results of investigations in the Jordan Valley are supported by comparison with those obtained by J. Hann in Algeria and Egypt (*Handbuch der Klimatologie*, Stuttgart, 1910–11) and by A. Balachowsky in Egypt [*R.A.E.*, A **16** 669]. Larvae appear when the temperature reaches about 15°C. [59°F.], and those appearing in May develop in 31–45 days, the adult stage up to oviposition and the egg stage occupying a further 20–34 days. The ratio of males to females throughout the year is about 1 : 4. The average numbers of eggs per female were 47·7 throughout the year on leaves of grapefruit and 61 and 29·7 in autumn on the fruit and leaves, respectively. The largest number of eggs found to have been laid by one female in monthly counts was 148 in April. In isolated breedings of 10 females begun in early May, an average of 20·8 larvae per female and a maximum of 54 succeeded in settling. Fluctuations in population were studied on a grapefruit tree, two years old, to which larvae, 76 of which settled, were transferred during May. Population was highest in November at the picking season. Defoliation from January to March was reflected in rapid decline in numbers and in May the population had fallen to 24, the lowest point, probably on account of the dry winds. The quotient of increase is highest when the temperature exceeds 24°C. [75·2°F.] and the relative humidity 60 per cent. In the field, trees are attacked when they have begun to yield crops. Conditions are then much more favourable than on young trees. During the first year, the lower leaves are infested, and later the inner part of the tree. Infestation occurs chiefly in northern Palestine, and spreads very rapidly into every grove during the first years of cropping. Yearly fumigation with hydrocyanic acid gas is considered essential. *C. ficus* is 2·8 times as fertile as the red scale [*Aonidiella aurantii*, Mask.] in the Jordan Valley [**24** 477], and in general, the results of control measures against it are poorer ; it is, therefore, a more serious pest.

POTGIETER (J. T.). **The Argentine Ant.**—*Fmg in S. Afr.* 1937 repr. no. 40, 2 pp., 1 fig. Pretoria, April 1937.

Notes are given on the distribution of *Iridomyrmex humilis*, Mayr, in the Union of South Africa, and on its economic importance, principally in relation to the protection it gives to Aphids and Coccids that secrete honey-dew. The composition of an ant colony is described. Directions are given for the preparation of a bait of 5 gm. lead arsenate, 2 lb. white sugar and 1 pt. water, which should be used from late autumn until the beginning of the hot, dry season, when the ants feed more readily on it, as there is a scarcity of honey-dew. A container holding about 2 fl. oz. should be used on fruit-trees and vines and the bait renewed every 2 or 3 weeks. Every tree should have a container, and also every vine where infestation by mealybug is heavy ; for the rest of the vineyard, one container to 20–25 vines is sufficient. If the bait is not to be used where it may leak on to trees or roots of plants, 5 gm. sodium arsenite may be substituted for the lead arsenate, as it kills the ants much more rapidly but is harmful to plants.

RIPLEY (L. B.) & PETTY (B. K.). **Cerambycid Beetles attacking Wattles.**—*Fmg in S. Afr.* 1937 repr. no. 50, 2 pp., 5 figs. Pretoria, May 1937.

As a result of leaving wattle [*Acacia*] slash unburnt to favour the development of diseases of the wattle bagworm [*Acanthopsyche junodi*, Heyl.] [*R.A.E.*, A **15** 19] and for silvicultural reasons, there has been a marked increase during the past 2 or 3 years, in various districts in South Africa, in the abundance of two species of Lamiids, *Ceroplesis thunbergi*, Fhs., and *Pycnopsis brachyptera*, Thoms. Both have one generation a year. The adults of one appear from October to the end of December, and of the other in March, April and May. The eggs are laid and the larvae develop in dying trees, but the adult beetles, which live for several weeks, strip the bark from the tips of the living branches, doing considerable damage to both black and green wattles [*Acacia mollissima* and *A. decurrens* var. *normalis*]. In the district where the worst outbreak has occurred, the death of large numbers of trees from an unknown cause has provided excellent breeding places.

Though the burning of slash cannot be generally recommended, on account of the advantages of non-burning for the control of the wattle bagworm, it must be used as an emergency measure in the case of particularly serious outbreaks. All slash in which eggs have been laid to an appreciable extent should be burnt. The avoiding of stripping or thinning near or during outbreaks is not considered wise, as it does not reduce the beetle population and would lead to the spread of infestation by beetles searching for dying trees in which to oviposit. All dying trees should be felled and the wood burnt if infested. If the wood is not to be burnt, all felling should be done at such a time that the bark will be dry before the emergence of the beetles in October or March.

NEL (R. G.). **The Utilization of low Temperatures in the Sterilization of deciduous Fruit infested with the immature Stages of the Mediterranean Fruit Fly,** *Ceratitis capitata* **Wied.**—*Sci. Bull. Dep. Agric. S. Afr.* no. 155, 33 pp., 4 diagrs., 8 refs. Pretoria, 1936. Price 3*d*. [Recd. August 1937.]

An account is given of experiments in 1932–35 in Capetown on the effect of cold storage on the immature stages of *Ceratitis capitata*, Wied., in nectarines, peaches, plums and grapes. The results were independent of the kind of fruit ; the fruits were exposed in single layers on trays. The minimum exposures in days at 31, 34 and 37°F. necessary to kill all eggs and larvae were 8, 11 and 12, and 10, 12 and 16, respectively. Complete mortality of pupae, which were exposed under conditions similar to those in fruit packs, was obtained in 8 days at 31°F. and in 21 days at 34 and 37°F. In the case of the two higher temperatures no shorter exposures were tried, and the minimum lethal period may be much less.

Owing to the impossibility of maintaining constant temperature conditions during commercial pre-cooling and transport, tests were made with varying temperatures. The results showed that complete larval mortality could be obtained following exposures of 2 days at 31°F. and 17 at 34°, 4 days at 31° and 6 at 37°, or 4 days at 34° and 12 at 37°F. It appears, therefore, that commercial pre-cooling, combined with refrigerated shipping, could readily be adapted to disinfest South African fruit intended for markets in countries in which the entry of fresh fruit from infested areas is prohibited.

Experimental consignments of infested grapes that had been subjected to various pre-cooling exposures, of which the least severe were 15 hrs. at 34° or 6 days at 37°, and were then shipped for 17 days in refrigerated holds contained no living examples of *C. capitata* when examined on arrival in England.

FRAPPA (C.). **Les principaux insectes nuisibles aux cultures de Madagascar.**—*Rev. Bot. appl.* **17** no. 191 pp. 513–516. Paris, July 1937.

This is a survey of the numerous insect pests that have been recorded on rice, coffee, vanilla, sugar-cane, fruit trees, vegetables, cotton, tobacco and forest trees in Madagascar during the last ten years.

The Termite in Bermuda : Introductory Notes.—*Agric. Bull. Bermuda* **16** no. 7–8 pp. 37–39. Hamilton, 1937.

In one locality in Bermuda, termites were found to have attacked 38 out of 100 cedars, *Juniperus* [*bermudiana*], chosen in groups of 20 at random. Damage was most severe in older trees, but was also common in young ones. Fiddlewood [*Citharexylum*] and avocado [*Persea gratissima*] were also infested, as well as timbers of sheds, fences, etc. Attack starts at a wound or dead stump of a sawn-off branch, or in the wood exposed by stripping the bark, and spreads to the heart of the tree. Wooden structures are protected to some extent by paint, but scarcely at all by limewash. Two species of termites that have been found in Bermuda were identified as *Calotermes castaneus*, Burm., and another species of the same genus.

SEAMANS (H. L.). **A probable cultural Control for the Pale Western Cutworm,** *Agrotis orthogonia* **Morr.**—*Sci. Agric.* **17** no. 10 pp. 612–615. Ottawa, 1937. (With a Summary in French.)

A recent study of *Porosagrotis* (*Agrotis*) *orthogonia*, Morr. (pale western cutworm) in Canada showed that the eggs hatch as soon as the soil has thawed to a depth of 2 inches, provided that moisture is present. The newly-hatched larvae may remain for several weeks in the cold earth; they begin to feed as soon as vegetation starts to grow. It was demonstrated in laboratory experiments that newly-hatched larvae can withstand long periods of starvation when kept cool, but when they have fed, they can only survive a few days if food is no longer available. Older larvae can withstand 2–3 weeks' starvation. In the spring of 1936, two fields, each of 640 acres, that had been severely infested in 1935 were disked, and wheat was sown 2–13 days afterwards in one, but not for 10 days in the other. Sowing was completed on 29th April in the first field and on 19th May in the second. Cutworms seriously injured the crop in the first field on all plots in which the delay between disking and sowing was less than 5 days. There was little or no damage on the other plots. In the second field, the loss through cutworms was less than 1 per cent. A study of records kept since 1921 of fields in Alberta and Saskatchewan showed that fields in which sowing had taken place some time after cultivation and before 15th May, some time after cultivation and after 15th May, and immediately after cultivation, had suffered respectively 13·05, 29·04 and 54·51 per cent. damage. The length of time that elapsed between cultivation and sowing in the first two cases is not known. An inquiry into the methods used by farmers who consistently grew crops free from cutworm injury in highly infested areas showed that they all allowed 7–10 days to elapse between cultivation and sowing.

GILLIATT (F. C.). **Natural Control of the grey-banded Leaf-roller,** *Eulia mariana* **Fern., in Nova Scotia Orchards.**—*Canad. Ent.* **69** no. 7 pp. 145–146. Orillia, July 1937.

During the winter of 1935–36 a mortality of 32 per cent. occurred among the pupae of *Eulia mariana*, Fern. (grey-banded leaf roller) in two localities in Nova Scotia, where it is a serious orchard pest. About 3 per cent. of this mortality was due to parasites and 21 per cent. to predators. Several Dipterous and Hymenopterous parasites were reared from larvae and pupae of *E. mariana* collected in four localities in 1935; they included the Tachinid, *Zenillia blanda*, O.S., which parasitised slightly less than 3 per cent. in one place, and an Ichneumonid, *Glypta* sp., which attacked slightly less than 2 per cent. in two others. Parasitism by the other species was much lower. In June 1935, about 1–6 per cent. of the eggs of *E. mariana* were attacked by a parasite that was possibly *Trichogramma minutum*, Riley. Nymphs and adults of *Podisus maculiventris*, Say, which were abundant in 1935, fed freely on the larvae, up to 9 Pentatomids being observed in some larval shelters. *Deraeocoris fasciolus*, Knight, and *Anthocoris musculus*, Say, also preyed on the smaller larvae.

METCALF (Z. P.). **Peanut " Pouts."**—*Science* **86** no. 2234 p. 374. New York, 22nd October 1937.

Recent experiments in North Carolina have shown that a condition of ground-nuts locally known as " pout " is caused by the mass effect of toxins injected by *Empoasca fabae*, Harr. It first appears as a blackish discoloration at the tip of the leaflet and may progress till the whole leaf turns blackish, shrivels and dies. The leafhoppers disappear from the fields (probably migrating to soy beans) about the time that the plants bloom, and the latter then recover. In experiments, ground-nut plants developed the symptoms only when attacked by leafhoppers, suffered from them as long as the leafhoppers remained, and recovered if freed and kept free from infestation. If the number of leafhoppers was large, the plant was killed outright. In the laboratory, small plants with two leaves that were in good condition and were stimulated by plant food and frequent waterings were able to outgrow the effect of one or two leafhoppers per plant, but were killed by three or more.

HILLS (O. A.). **The Beet Leafhopper in the Central Columbia River Breeding Area.**—*J. agric. Res.* **55** no. 1 pp. 21–31, 7 figs., 4 refs. Washington, D. C., 1st July 1937.

The following is based on the author's summary: Ecological studies of the beet leafhopper, *Eutettix tenellus*, Baker, were made in the breeding area in the central Columbia River valley, in south-central Washington and north-eastern Oregon. In this area there are three broods, the adults of which appear in June, late July and August, and September. The more important food-plants are *Sisymbrium* (*Norta*) *altissimum*, *Erodium cicutarium*, and *Salsola pestifer*. The leafhopper usually disperses from this breeding area between 20th May and 30th June, movements being more or less continuous during this period. Return to the autumn and winter food-plants, *Sisymbrium* and *Erodium*, occurs during October and is largely a forced movement caused by the drying of the summer hosts, principally *Salsola*. If germination of the autumn food-plants is delayed by drought until after *Salsola* has dried, considerable mortality is likely to result. High percentages of curly-top of beet (grown experimentally in this area) and tomatos are directly correlated with large spring-brood populations of the leafhopper. Large populations of the summer and autumn broods are relatively unimportant in this respect, except as they affect the magnitude of the spring brood in the following year. Winter mortality is usually of comparatively little importance in this area. In only one winter (not the coldest) of the four observed was there severe mortality, and this was due to the absence of snow cover during sub-zero weather, with a minimum temperature of –9°F., which not only subjected the insects to intense cold but also killed their food-plants.

Seasonal variations in colour patterns of the leafhopper have been observed in this area. In general, dark forms predominate during winter, greenish forms during spring, and straw-coloured forms during summer. Studies were made of seasonal ovule development. Development drops to zero in September and does not begin again until late February or early March.

TOMPKINS (C. M.). **A transmissible Mosaic Disease of Cauliflower.**—*J. agric. Res.* **55** no. 1 pp. 33–46, 5 figs., 23 refs. Washington, D.C., 1st July 1937.

The following is largely taken from the author's summary: A mosaic disease of cauliflower, caused by a hitherto undescribed virus, is recorded in this paper. It occurs chiefly in the cool, coastal valleys of California, frequently causing considerable loss to the crop. It is characterised by stunting of the plant; vein clearing followed by vein banding, mottling, necrotic spotting, curvature of midrib, and distortion of the leaves; and dwarfing of the terminal head. H. P. Severin found that *Brevicoryne brassicae*, L., *Rhopalosiphum pseudobrassicae*, Davis, and *Myzus persicae*, Sulz., which breed on crucifers under natural conditions, are vectors of the virus; and that 10 additional species of Aphids, which have not yet been found to breed on cauliflower under natural conditions, are capable of transmitting it. It is also transmissible by artificial juice inoculations when carborundum is used as an abrasive.

The host range includes 51 varieties of vegetables, 3 ornamental plants, and 5 weeds, all belonging to the family Cruciferae.

RIES (D. T.). **Biology of the Boxwood Leaf Miner** (*Monarthropalpus buxi* **Labou**) **in Michigan.**—*Pap. Mich. Acad. Sci.* **22** pp. 665–669, 3 pls. Ann Arbor, Mich., June 1937.

Box [*Buxus sempervirens*] is not commonly grown in Michigan, but was severely infested near Detroit in 1931 by *Monarthropalpus buxi*, Lab. (boxwood leaf miner), all stages and larval instars of which are described. Instead of retaining their leaves for several years, infested plants rarely keep them for more than slightly over a year. In this area, adults begin to emerge from the leaves in late May and continue for 10–12 days. Eggs are deposited inside the leaves. Nearly 200 females laid an average of 33 eggs each in the laboratory, while 45–70 were found in the ovaries of others. The eggs hatch in 2 weeks, and the larvae pass through four instars, in the third of which they overwinter. The first, second and fourth instars last about 4, 6–10 and 2–3 weeks, respectively. Pupation takes place in early May. Adults live 7–10 days in calm weather. The larvae do not appear to feed in the first instar, but when they reach the second, they seem to feed on the contents of the cells around the oviposition cavity, which grow abnormally large. As no noticeable enlargement takes place previously, it seems possible that the larvae produce an enzyme that causes the abnormal growth of the cells.

SCHOENE (W. J.), CAGLE (L. R.), BOBB (M. L.) & JEFFERSON (R. N.). **The Oriental Peach Moth in Virginia Apple and Peach Orchards.**—*Bull. Va agric. Exp. Sta.* no. 308, 23 pp., 16 figs., 6 refs. Blacksburg, Va, April 1937.

Infestation of peach by the oriental peach moth [*Cydia molesta*, Busck] in Virginia has been consistently reduced by the elimination of varieties ripening later than Hales and Elbertas [*cf. R.A.E.*, A **20** 633], as well as by parasites and unfavourable weather. In order to determine whether apples grown next to peaches supply food for the larvae late in the season when there are no peach fruits, and so maintain the infestation [*cf.* **18** 217; **25** 485], comparative population studies were carried out by means of bait pails in orchards containing either apples, apples and peaches, or large plantings of peaches next to apples for 2, 1 and 8 years (1929–36) respectively [*cf.* **18** 621]. The situation and layout of the orchards are described. Quart fruit jars were used for the bait of sorghum molasses and water, 1 : 20, except in one orchard in 1929 when half-gallon tin pails were used. The numbers of moths caught were usually determined twice weekly. The following is largely taken from the authors' summary: The large number of moths caught throughout the season in apple orchards adjacent to peaches in contrast to the small number caught in apple orchards some distance from peaches indicates that the population in apples is increased by the presence of peaches. Where apple and peach orchards were adjoining, the greatest catch of moths during the spring (overwintered) brood was always made in pails near the dividing line between the two ; whereas, during the first and second broods, the moths were decidedly more abundant in the peach orchard, only a few being caught on apples except on those trees near the peaches. It seems apparent that the increase in the catch of moths on peach trees next to the apple orchard in the spring was brought about by moths that had developed from larvae that had overwintered in the apple orchard.

It is concluded as a result of this study that *C. molesta* can inflict very serious injury on peaches when the conditions are favourable for its development, but that, in many years, the dry weather in early summer causes the hardening of the twigs, reducing the number of larvae with a consequent reduction of injury to the peach fruit. No serious injury to apple twigs or fruit was observed, although the moths were caught each year in considerable numbers in bait-pails exposed in apple trees. The apple supplies food in the autumn when there are no peaches and when peach twigs are not suitable for the larvae. The moth can maintain itself in orchards with apples as the only food, but it is believed that the small size of the fruit at the time that the first-brood larvae are hatching acts as an annual check. The data indicate that when apples and peaches are adjacent to each other, the moth population is greater than it is when either stands alone. Past experience indicates that it is practically impossible to grow profitable crops of late varieties of peaches, and that varieties that mature later than the Elberta should not be planted.

BARTLETT (K. A.). **The Introduction from Fiji into Puerto Rico of a Predator of the Banana Corm Weevil.**—*Agric. Notes Puerto Rico Exp. Sta.* no. 79, 3 pp. Mayaguez, P. R., 28th June 1937. **The Introduction and Colonization in Puerto Rico of** *Macrocentrus ancylivorus*.—*Op. cit.* no. 80, 4 pp. 6th July 1937.

The first of these papers, which are part of a series [*R.A.E.*, A **25** 616], deals with the introduction of *Plaesius javanus*, Er., into Porto Rico for the control of the banana weevil, *Cosmopolites sordidus*, Germ. Of a shipment of 575 adults of this Histerid dispatched from Fiji on 12th February 1936, 568 were alive on arrival at Porto Rico on 1st March, and these fed readily on *Cosmopolites* larvae. Liberations were made in March and June. It is thought that conditions are very favourable for the establishment of the beetles, but that some years are likely to elapse before their presence is obvious.

In the second paper, details are given of the introduction of *Macrocentrus ancylivorus*, Rohw., from New Jersey into Porto Rico for the control of *Etiella zinckenella*, Treit., *Maruca testulalis*, Geyer, and *Fundella cistipennis*, Dyar, all infesting lima and other beans [*cf.* **19** 488 ; **23** 113]. In July 1936, 5 shipments comprising a total of 8,729 parasites were despatched by aeroplane ; 8,296 were alive on arrival and 7,284 were liberated. Details of the numbers received and liberated, and the dates and localities of liberation are shown in tables. Under laboratory conditions, the parasite was successfully reared on *F. cistipennis*, *M. testulalis*, and the lesser corn stalk borer, *Elasmopalpus lignosellus*, Zell. The female inserts its ovipositor into the bean pod through the feeding holes made by the host larva and deposits an egg in the body of the latter. The parasite larva lives within the host till full-grown, emerging to spin a brown silky cocoon within which it pupates. The duration of the immature stages was 21–29 days.

FENNAH (R. G.). **Lepidopterous Pests of the Sour-sop in Trinidad. (2.)** *Thecla ortygnus* **Cramer.**—*Trop. Agriculture* **14** no. 8 pp. 244–245, 2 pls., 1 ref. Trinidad, August 1937.

Thecla ortygnus, Cramer, all stages of which are described, is a minor pest of sour-sop [*Anona muricata*] in Trinidad. Individual trees may be severely attacked at times, but the intensity of infestation varies greatly from tree to tree at all periods of the year. The egg, larval and pupal stages last 3–4, 11–12 and 12–14 days, respectively. The eggs are laid on or near the flowers or young fruit ; a single fruit or flower generally bears only one egg, but up to five are sometimes present. The newly hatched larva may begin to feed on the surface of the flower, but usually bores directly into it. A larva that hatches from an egg deposited on a young fruit bores into the pulp without feeding at the surface. In the laboratory, larvae were reared on pulp of fruit of all sizes, but in the field they were only taken on very young fruit. The larva remains in one flower or fruit until it is full-fed and then migrates to some sheltered situation for pupation. Control methods recommended are the removal of eggs at intervals of 2 days and the application of a weak lead arsenate spray to flowers over ½ in. long.

GOBBATO (C.). **Principaes pragas e molestias das vides cultivadas no Rio Grande do Sul.** [The chief Pests and Diseases of Grape-vines in Rio Grande do Sul.]—*Rodriguésia* **2** spec. no. pp. 187–190. Rio de Janeiro [1937].

A list is given of 29 insects and 3 mites that attack grape-vines in the state of Rio Grande do Sul, Brazil. The chief are *Eurhizococcus* (*Margarodes*) *brasiliensis*, Hemp. [*R.A.E.*, A **18** 640], which is widely distributed, and *Phylloxera vitifoliae*, Fitch (*Peritymbia vastatrix*, Planch.), which is most injurious in dry weather, as heavy rains check the development of the root form though they increase infestation of the leaves by the gallicolae.

BONDAR (G.). **Curculionideos do genero** *Conotrachelus*, **nocivos ao cacaueiro.** [Curculionids of the Genus *Conotrachelus* harmful to the Cacao Tree.]—*Rodriguésia* **2** no. 8 pp. 41–42, 1 fig., 1 pl. Rio de Janeiro, 1937.

In Brazil, various weevils of the genus *Conotrachelus*, including about ten unidentified species, develop in the fruits of wild trees and feed in the adult stage on cacao, causing the death of the shoots and deformation of the fruits. Of the identified species concerned, *C. praeustus*, Boh., breeds in the seeds of *Schwartzia psilonema*, *C. costirostris*, Boh., and *C. inconcinnus*, Boh., in the fruits of *Guarea*, *C. mamillatus*, Boh., in the fruits and seeds of Sapotaceae, *C. quadrinotatus*, Fhs., in the pods of *Inga edulis*, and *C. curvecostatus*, Mshl., in the pods of this and other species of *Inga*. The control measure advocated is the elimination from cacao plantations of the trees in the fruits of which the weevils breed.

De Santis (L.). **Los parásitos e hiperparásitos argentinos de los insectos perjudiciales á la agricultura (Hymenoptera). Primera nota. Un parásito de la cochinilla blanca del rosal. Un parásito secundario de los pulgones.**—*Bol. Agric. Prov. B. Aires* **16** no. 11 pp. 5–15, 3 figs., many refs. La Plata, 1936. [Recd. September 1937.]

A redescription is given of the Encyrtid, *Epiencyrtoides aulacaspidis*, Brèthes, with notes on the characters of the genus. This species is an endophagous parasite of *Aulacaspis rosae*, Bch., on roses in La Plata, Argentina. The Pteromalid hyperparasite, *Asaphes vulgaris*, Wlk., was obtained in La Plata from *Anuraphis persicae-niger*, Smith, *Toxoptera aurantii*, Boy., *Brevicoryne brassicae*, L., and *Aphis hederae*, Kalt., all parasitised by Aphidiine Braconids. It was not reared from *Eriosoma lanigerum*, Hsm., parasitised by *Aphelinus mali*, Hald.

De Santis (L.). **Un himenóptero, parásito de la cochinilla roja de los citrus, nuevo para la fauna argentina** (*Aphytis chrysomphali*, **G. Mercet**).—*Rev. Fac. Agron. La Plata* **20** no. 2 pp. 262 *et sqq.* (repr. 12 pp.), 7 figs., 20 refs. Buenos Aires, 1935. [Recd. September 1937.]

Notes are given on the morphology and synonymy of the Aphelinid, *Aphytis chrysomphali*, Mercet, here recorded for the first time in Argentina, where it was found near the city of La Plata parasitising *Chrysomphalus dictyospermi*, Morg., on *Citrus*, laurel, ivy, etc., and *Protargionia larreae*, Leon., on *Sophora japonica* var. *pendula*. Of 100 examples of each Coccid collected at random 40 of *C. dictyospermi* and 33 of *P. larreae* were parasitised by it.

Wille (J. E.), Ocampo (J. A.), Wéberbauer (A.) & Schofield (D.). **El cube** (*Lonchocarpus nicou*) **y otros barbascos en el Perú.** [Cubé and other Barbasco Plants in Peru.]—*Bol. Estac. exp. agric. Minist. Fom. Peru* no. 11, 117 pp., 23 pls., 163 refs. Lima, June 1937.

This bulletin comprises a survey, mostly from the literature, of the history, cultivation, geographical distribution, chemistry and use as an insecticide of cubé (*Lonchocarpus nicou*), which is widely distributed in Peru. A list is given of the South American plants popularly known as cubé and barbasco, the most important being *L. nicou* in Peru and *L. urucu* in Brazil. Of recent years the term cubé has been limited to *L. nicou*. This plant grows wild over an extensive territory and is also cultivated in many localities with a moist, tropical climate. It does not appear to be attacked by insects or fungi. Insects against which cubé has proved effective are listed in their families and also those against which it is ineffective.

In tests against the chief pests of cotton in Peru, sprays of cubé extract containing 0·05 or 0·01 per cent. rotenone proved as effective against *Aphis gossypii*, Glov., as 0·5 per cent. nicotine sulphate. Dusts of ground cubé root of 5 and 1 per cent. rotenone content gave 50 and 15 per cent. mortality, respectively, of adults of *Anthonomus vestitus* Boh., in the laboratory. Sprays of cubé extract of up to 0·05 per cent. rotenone content had no effect on larvae of *Anomis luridula*, Gn. (*texana*, Riley) and *Alabama argillacea*, Hb., but in another series of tests, a spray of 0·01 per cent. rotenone content gave 75 per cent.

mortality after 8 days, and surviving larvae were unable to moult normally. A suspension of cubé dust in water to give a spray containing 0·3 per cent. rotenone killed 73 per cent. of the larvae in 5 days, but was not effective in the field, probably owing to imperfect wetting.

In laboratory tests against 20 adults of *Dysdercus ruficollis*, L., a cubé dust containing 5 per cent. rotenone killed 4 and paralysed the others in 24 hours, and after 4 days, 19 were dead. Dusts of lower rotenone content also gave good results, one of 0·01 per cent. giving 80 per cent. mortality in 5 days. One unfavourable result of this slow rate of toxicity was that females were able to oviposit normally, and their eggs hatched. Sprays of 0·1 per cent. rotenone content in three tests gave 52, 80 and 100 per cent. mortality, respectively.

It is concluded that in Peru cubé root and its products cannot replace the customary insecticides against plant pests. On the other hand, highly satisfactory results were obtained against parasites of domestic animals [*R.A.E.*, B 25 284].

[Efimov (A.)] **Ефимов (А.).** Ed. **List of Insect Pests in Japan, Chosen (Korea) and Taiwan (Formosa) (which have or may receive Quarantine Importance in U.S.S.R.).** [*In Russian.*]—Demy 8vo, 54 pp. Moscow, Centr. Lab. Quar. Adm., 1936. Price 2 *rub.* [Recd. 1937.]

This is the first of a proposed series of lists of pests and diseases of plants that occur in various countries and are liable to be imported into the Russian Union. It deals with over 400 species of injurious insects found in Japan, Korea and Formosa. It includes a list arranged in tabular form showing the principal pests under their food-plants, which are given in alphabetical order, the part attacked, the distribution of the pests in Japan, Korea and Formosa, and their occurrence in, or absence from, the Russian Union. This is followed by a systematic list of pests that are of special quarantine importance for the Russian Union, and by an additional list of 166 species of injurious insects of minor importance observed in Japan and not included in the first list; the food-plants are shown in each case. An index to the pests is appended.

[Kuznetzov (N. Ya.).] **Кузнецов (Н. Я.).** Ed. **General Entomology. Part II. Sections 3 & 4. Physiology and Toxicology of Insects.** [*In Russian.*]—Demy 8vo, 96 pp., 35 figs. Moscow, Gos. Izd. s.-kh. kolkh.-koop. Lit., 1931. Price 1 *rub.* [Recd. 1937.]

The first section (pp. 3–55) deals with the process of metabolism in insects, the subjects discussed being normal feeding and digestion, the effect on them of stomach insecticides, the functions of the haemolymph, respiration, and the effect on it of contact poisons. Notes on methods of conducting practical experiments are included. The second section deals with the excretory processes, the nervous and muscular systems of insects, and their sense organs.

[Kostina (K. F.).] **Костина (К. Ф.).** **The Apricot.** [*In Russian.*] —*Bull. appl. Bot.* Suppl. 83, 292 pp., 88 figs., 18 pp. refs. Leningrad, 1936. Price 8 *rub.* (Summary in English 8 pp.). [Recd. 1937.]

In this book on the cultivation of apricot in the Russian Union, one section (pp. 252–257) contains notes on the bionomics and control of its insect pests. The most important in Central Asia, the chief area in which apricots are grown, are the weevil, *Rhynchites auratus ferganensis*, Nevsk. [*cf. R.A.E.*, A **17** 587] ; the Noctuid, *Cosmia subtilis*, Stgr. ; the Geometrids, *Pterotocera declinata*, Stgr., and *Apocheima* (*Biston*) *cinerarius*, Ersch. [*cf.* **22** 458] ; *Eurytoma samsonovi*, Vass., which is widely distributed in Central Asia, its bionomics being similar to those of *E. amygdali*, End. [**19** 595] ; and a species of *Coleophora*, of which the bionomics resemble those of allied species in the Ukraine [**19** 500]. The Buprestids, *Capnodis tenebrionis*, L., and *C. tenebricosa*, Ol., attack apricots and other fruit trees in the Crimea, the adult beetles gnawing the young shoots and leaf stems, and the larvae infesting the roots [*cf.* **21** 312].

RUSZKOWSKI (J. W.). **Szkodniki pól i warzywników obserwowane w Polsce w r. 1934.** [Pests of Field Crops and Vegetables observed in Poland in 1934.]—*Roczn. Ochr. Rośl.* **3** fasc. 3 pp. 1–24. Warsaw, 1937.

PRÜFFER (J.). **Szkodniki traw zbożowych zaobserwowane w Polsce w 1934 roku.** [Pests of Cereals observed in Poland in the Year 1934.]—*T.c.* pp. 25–31. **Szkodniki śpichrzów i młynów, zaobserwowane w Polsce w 1934 roku.** [Pests of Granaries and Mills observed in Poland in the Year 1934.]—*T.c.* pp. 31–32.

MINKIEWICZ (S.). **Szkodniki sadów obserwowane w Polsce w r. 1934.** [Pests of Orchards observed in Poland in 1934.]—*T.c.* pp. 33–66.

KRASUCKI (A.). **Szkodniki krzewów owocowych obserwowane w Polsce w roku 1934.** [Pests of Fruit Bushes observed in Poland in the Year 1934.]—*T.c.* pp. 67–70.

These papers contain lists of pests, chiefly insects, recorded from various districts in Poland, with brief notes on their local distribution, abundance, the stage observed and the date of observation. The last paper also records pests of strawberries and vines.

PRÜFFER (J.). **O charakterze rójki chrabąszcsy w 1936 r. ze szczególnym uwzględnieniem rójki kasztanowca** (*M. hippocastani*). [The Character of the Flight of Cockchafers in Poland in the Year 1936 with special Reference to the Flight of *M. hippocastani*.]—*Roczn. Ochr. Rosl.* **4** fasc. 1 pp. 1–13, 2 maps. Warsaw, 1937. (With a Summary in German.)

Investigations on the occurrence of cockchafers [*cf. R.A.E.*, A **24** 676] in Poland were continued in 1936, when they were abundant in the north-east. *Melolontha hippocastani*, F., was the predominant species, but swarms of *M. melolontha*, L., were observed in some places. Details are given of the local distribution of these two species. The fact that large swarms of *M. hippocastani* last occurred in north-eastern Poland in 1932 indicates that it has a four-year life-cycle [*cf. loc. cit.*]. In other parts of the country *M. melolontha* alone appeared, and this in but a few districts.

MAGERSTEIN (V.). **Verzweigung der Weidenruten durch Insektenbefall.** [The Branching of Willow Rods caused by Insect Attack.]—*Kranke Pflanze* **14** no. 9 pp. 150–152, 1 pl. Dresden, September 1937.

An account is given of the branching of willow rods caused in Czechoslovakia by *Earias chlorana*, L., and *Rhabdophaga rosaria*, H. Lw. [*cf. R.A.E.*, A **23** 85].

JANCKE (O.). **Weitere Versuche zur Bekämpfung des Reblauswintereies.** [Further Experiments against the Winter Egg of *Phylloxera*.]—*Dtsch. Weinbau* **15** no. 12 pp. 179–180. Mainz, 5th April 1937. [Recd. September 1937.]

Following preliminary experiments in 1934 with tar distillates against the winter eggs of *Phylloxera* on vines, tests with 3 proprietary brands of fruit-tree carbolineum and 3 of "Baumspritzmittel" [*R.A.E.*, A **24** 797] were made in 1935 in Baden and Upper Alsace. The sprays were applied to the vine stocks between 20th and 29th March at concentrations of 4, 5, 6 and 8 per cent. Inspection during the second half of July showed that none of them had caused any injury to the vines. The effect on *Phylloxera* could not be ascertained in Baden, as the only leaf galls found were on a single vine in an unsprayed plot. The infestation in Alsace, though moderate, was sufficient to enable the effect to be estimated. There was no evidence that the sprays were less effective at weaker concentrations or more effective on stocks on which the bark had been scraped before they were applied. In some plots, no May galls were seen on the leaves of the treated vines ; in others they occurred, evidently owing to faulty application of the spray, but always in much smaller numbers than on untreated vines. All the sprays were effective except one of the brands of carbolineum. For future use, a strength of 5–6 per cent. is considered fully sufficient.

FRANCKE-GROSMANN (H.). **Zur Morphologie der Tannenlaus** *Dreyfusia prelli* **Grosmann und ihrer Galle auf** *Picea orientalis* **Lk.** [The Morphology of the Silver Fir Aphid, *Chermes prelli*, and of its Gall on *P. orientalis*.]—*Z. PflKrankh.* **47** no. 9 pp. 465–482, 12 figs., 1 pl., 31 refs. Stuttgart, 1937.

This paper deals with the morphology of the gall and of the various stages of *Chermes* (*Dreyfusia*) *prelli*, Grosmann, on oriental spruce (*Picea orientalis*) and silver firs (*Abies nordmanniana* and, occasionally, *A. cephalonica*) in Germany [*cf. R.A.E.*, A **24** 267]. Infestation occurs on the lower branches of oriental spruce, which is the primary food-plant, and in the summit of the crown of silver fir.

BERAN (F.). **Ein neuer Apparat zur Bestimmung der Fangkraft von Raupenleimen.** [A new Apparatus for determining the Tenacity of Banding Adhesives.]—*Z. PflKrankh.* **47** no. 9 pp. 482–486, 3 figs. Stuttgart, 1937.

A description is given of a modification of an apparatus for testing the tenacity of banding adhesives [*R.A.E.*, A **22** 114], which enables the rate of movement of the grooved roller over the adhesive surface to be recorded on graph paper. The correctness of the results was confirmed by tests of the efficiency of the adhesives on bands under natural conditions.

Die ersten Kartoffelkäferfunde in den Niederlanden und in der Schweiz. [The first Records of the Potato Beetle in Holland and in Switzerland.]—*NachrBl. dtsch. PflSchDienst* **17** no. 8 p. 62. Berlin, August 1937. **Weitere Kartoffelkäferfunde in den Niederlanden und in der Schweiz.** [Further Records.]—*T.c.* no. 9 p. 71. September 1937.

The potato beetle [*Leptinotarsa decemlineata*, Say] was found in Holland for the first time on 6th July 1937, when 70 larvae were discovered at Castenraai, about 36 miles from the Belgian frontier. On 9th August, a second infestation was discovered at Baarlo, close to the German frontier.

In Switzerland, an infestation was found in mid-June in the Joux valley close to the French frontier and at the end of June several foci were noticed round Geneva. Since then, 250 infestations have been recorded in western Switzerland in the cantons of Geneva, Vaud, Neuchâtel, Fribourg and Berne.

Weitere Kartoffelkäferfunde an der Westgrenze. [Further Records of the Potato Beetle at the western Frontier of Germany.]—*NachrBl. dtsch. PflSchDienst* **17** no. 9 p. 71. Berlin, September 1937.

Records are given of the occurrence in Germany [*cf. R.A.E.*, A **25** 640] of the potato beetle [*Leptinotarsa decemlineata*, Say] between 20th July and 24th August 1937 in one locality nearly a mile from the Swiss frontier and in five localities at distances ranging up to 15 miles from the French frontier.

HERSCHLER (A.). **Magnesiumsulfat-Kalkbrühe als Träger von Arsenmitteln.** [Magnesium Sulphate and Lime Mixture as a Carrier for Arsenicals.]—*NachrBl. dtsch. PflSchDienst* **17** no. 9 p. 71. Berlin, September 1937.

For spraying vines in Germany, it has been a common practice to increase suspension, visibility and resistance to rain of Paris green or calcium arsenate by combining it with a dilute Bordeaux mixture containing 1 per cent. copper sulphate, even if the latter is not required as a fungicide. The author states that Bordeaux mixture containing only 0·5 per cent. copper sulphate is sufficient for these purposes, but in view of the need for economy in the use of products containing copper, he suggests that Bordeaux mixture be replaced by a mixture of magnesium sulphate and lime, which has the same powers of increasing suspension, wetting and adhesion at the same concentration and is prepared in the same way. For a 1 per cent. concentration, 10 lb. magnesium sulphate is dissolved in 50 gals. water and this solution is released in a thin jet into a suspension of either 5 lb. white quick-lime and 4 lb. calcium arsenate or 7 lb. white quick-lime and 2 lb. Paris green in 50 gals. water. If the spray cannot be applied at once, the addition of 0·5 lb. sugar per 100 gals. will confer keeping power, as it does with Bordeaux mixture.

LAUBERT (R.). **Eine wenig bekannte Schädigung von Blütenbegonien.** [A little known Injury to Begonias.]—*NachrBl. dtsch. PflSchDienst* **17** no. 9 p. 72. Berlin, September 1937.

Pegomyia bicolor, Wied., is recorded as mining the leaves of winter-flowering begonia at Mülheim, north-western Germany. The infestation was controlled by crushing the larvae in their mines and by destroying infested leaves. *P. bicolor* is usually found on polygonaceous plants, but has been observed on begonias in France [*R.A.E.*, A **12** 480].

Amtliche Pflanzenschutzbestimmungen. [Official Regulations on Plant Protection.]—*Beil. NachrBl. dtsch. PflSchDienst* **9** no. 6 pp. 120–141. Berlin, 1st September 1937.

This issue includes the text of a regulation dated 20th July 1937 against *Leptinotarsa decemlineata*, Say. It prohibits the importation into and transit through Germany from France, Belgium and Luxemburg of potatoes, tomatos, egg-plants, plants with roots, all underground parts of plants, and sacks and other material that have served for packing or storing such plants and their débris.

Between 1st April and 14th November, fresh vegetables and the aerial parts of plants, except fruit and those specified above, may be imported from France, Belgium and Luxemburg provided that they do not come from localities within 30 miles of the area infested by *L. decemlineata*, are accompanied by an official certificate attesting this, and are found uninfested when examined on the frontier.

A list is given of plants that may be imported throughout the year if they are certified to be free from infestation by *L. decemlineata* and are found so at the frontier.

ZACHER (F.). **Ein neuer eingeschleppter Holzschädling.** [A new introduced Wood Pest.]—*Ent. Rdsch.* **54** no. 40 pp. 500–501, 1 fig. Stuttgart, 22nd July 1937.

The author states that he has received from a timber firm in Bremen an example of *Cyllene caryae*, Gah., found alive in American hickory wood.

FAHRINGER (J.). **Die Parasiten der Baumläuse (Lachnini) aus der Gruppe der Aphidiinae Först.**—*Festschr. 60. Geburtstage Prof. Dr. Embrik Strand* **3** pp. 240–245. Riga, 11th September 1937.

The Braconids of the subfamily APHIDIINAE that parasitise species of *Cinara* (*Lachnus*, auct.) and *Stomaphis* belong to the genera *Aclitus* and *Coelonotus*. Characters distinguishing these two genera are given, with keys to the species of each, showing their hosts and distribution, and descriptions of both sexes of *Coelonotus grossus*, sp. n., reared from *Cinara* (*L.*) *cecconii*, Del G., in Lower Austria.

GARAVINI (G.). **La lotta contro le cavallette e la protezione della selvaggina.** [Grasshopper Control and the Safeguarding of Game.]—*Rass. faunist.* **3** no. 3–4 pp. 58–66, 4 figs. Rome, 1936. [Recd. September 1937.]

Among the methods of controlling grasshoppers in Italy, the use of poison baits is the only one that might involve any danger to mammals or birds. Larger animals, however, cannot consume a lethal quantity of bait, which is scattered very thinly. That no danger exists to birds has been proved by keeping quail and pheasants in enclosures where bait was scattered in the usual manner. No deaths occurred even when no other food was given to the birds for several days, or when they fed on poisoned grasshoppers. Rabbits fed on sodium fluosilicate bait did not suffer, but were killed by bait prepared with sodium arsenite. They did not, however, ingest a lethal dose of poison when kept in an enclosure in which sodium arsenite bait was scattered much more thickly than is usual.

Plantesygdomme i Danmark 1936. Plant Diseases and Pests in Denmark in 1936.—*Tidsskr. Planteavl* **42** pp. 189–249, 2 graphs, 12 figs.; also as *Overs. St. Plantepat. Forsøg* no. 53. Copenhagen, 1937. (With a Summary in English.)

A list is given (pp. 193–204) of the pests and diseases of plants recorded in Denmark in 1936. Precipitation and temperature were slightly above normal. Pests that were injurious during the year included *Calocoris norvegicus*, Gmel. (*bipunctatus*, F.) on sugar-beet, *Agriotes* spp. on various crops, *Caliroa* (*Eriocampoides*) *limacina*, Retz., on cherry and pear, *Coleophora spissicornis*, Haw., which infested the flower-heads of red clover, and *Tipula paludosa*, Mg., in cereal fields and grassland. Spraying with nicotine (0·2 per cent.) was effective against the nymphs of *Eurydema oleraceum*, L., which severely attacked swedes, turnips and cabbages. Larvae of *Melolontha melolontha*, L. (*vulgaris*, F.) caused serious losses of swedes, beet, cereals, etc., and adults are expected to appear in great numbers in 1938. Derris dust had some effect on *Anomala* (*Phyllopertha*) *horticola*, L., a pest of fruit trees, shrubs and ornamental plants. Trials with dusts of Cryocide (natural cryolite) against *Apion* spp. on clover [*cf. R.A.E.*, A **24** 440] were continued with satisfactory results. Cryocide also proved effective as a dust against *Phyllotreta* spp. on crucifers, and as a spray against *Pteronus ribesii*, Scop., which defoliated gooseberries and then attacked currants. Observations of the dates of occurrence of various stages of *Cydia* (*Laspeyresia*) *funebrana*, Treit., on plums suggested that it has two generations a year in Denmark. *Cydia* (*Carpocapsa*) *pomonella*, L., is increasing in importance on apple; a calyx spray of lead arsenate was inadequate owing to the protracted oviposition period. In experiments against *Contarinia pyrivora*, Riley, on pear, nicotine sprays applied several times during the period when the adults were emerging from the soil gave promising results. It is essential to spray not only the crown of the tree but also the stem and the surrounding soil, where the midges rest early in the day or when the weather is cold and windy. The chrysanthemum midge, *Diarthronomyia hypogaea*, Lw., was found in a hothouse in the island of Funen [*cf.* **24** 55].

Meidell (O.) **Undersøkelse av mageinnhold hos gråtrost** (*Turdus pilaris* **L.**). [Investigation of the abdominal Contents of the Fieldfare, *T. pilaris*.]—*Nytt Mag. Naturv.* **76** pp. 163–236, 11 figs., 16 refs. Oslo, 1937. (With a Summary in English.)

This investigation into the stomach contents of the fieldfare (*Turdus pilaris*) carried out in southern Norway in 1926 and 1928–32 is based on the examination of the ventricles (ante-stomach and gizzard) of 62 adult and 35 young birds. The relative proportions of animal and vegetable nutrition are illustrated with figures for three classes of birds, a considerable portion of their diet consisting of insects. Birds taken on migration during the spring (up to 25th May) had eaten adults of medium-sized Coleoptera, principally those with hard shells and wings. The ventricles of birds taken from August to October contained, in addition to remnants of ants, Carabid, Curculionid and Chrysomelid adults and Carabid and Telephorid larvae. The autumn birds devour Coleoptera that are about to hibernate and therefore contain a high proportion of fat. Young birds had eaten comparatively large numbers of adults of the genera *Byrrhus*, *Phytodecta* and *Otiorrhynchus*, and fewer of Carabids. *Formica rufa*, L., was also occasionally found. For the whole series, Coleoptera formed about half the insect food.

Listo (J.) & Listo (E. M.). **Lisäkokeita hedelmäpuupunkin** (*Paratetranychus pilosus* **C. & F.**) **torjumiseksi.** [Additional Experiments for the Control of Fruit-tree Red Mite (*P. pilosus*).]—*Valt. Maatalousk. Julk.* no. 91, 12 pp. Helsinki, 1937. (With a Summary in English.)

An account is given of further field and laboratory experiments with proprietary combinations of mineral oil and tar distillate and an oil spray alone against the winter eggs of *Paratetranychus pilosus*, L., on fruit trees in Finland [*cf. R.A.E.*, A **23** 350]. Both types of sprays, applied at a concentration of 8 per cent., gave excellent results, especially in late treatments, though if spraying is delayed for too long injury to the trees may result. In tolerance tests, one of the four combined sprays caused considerable injury to the trees, two others affected them slightly, and no damage was done by the fourth or by the oil spray. Winter spraying was also effective against *Cheimatobia brumata*, L.

Barnes (H. F.). **Insects and other Pests injurious to the Production of Seed in Herbage and Forage Crops.**—*Bull. Herb. Publ. Ser.* no 20, 31 + iii pp. Aberystwyth, June 1937.

This paper is a summary of information on insect and other pests injurious to the production of seed in grasses and leguminous forage crops. It is divided into two parts, on grasses and leguminous crops, respectively, and each part comprises sections on general and indirect pests, pests that cause direct reduction of seed production, which are dealt with in greater detail, and insects that may become pests. The following particulars are given for each pest : the countries in which it occurs or is likely to occur ; the nature of the damage ; the characters by which it may be recognised ; and control measures. Indices of crops and pests are appended.

Jackson (D. J.). **Host-selection in** *Pimpla examinator* **F. (Hymenoptera).**—*Proc. R. ent. Soc. Lond.* (A) **12** pt. 7 pp. 81–91, 1 pl., 19 refs. London, 14th August 1937.

The following is the author's summary : A list is given of the recorded hosts of *Pimpla examinator*, F. The live-history of this species is summarised, and the habits of the female in puncturing pupae for feeding and oviposition are described. The development of the larva in hosts of different sizes is discussed, and a wide variation in the size of the offspring of a single mated female is recorded.

Females bred from pupae of *Abraxas grossulariata*, L., were offered pupae of various Lepidoptera as alternate hosts. Differences were observed in the reaction of the different females to pupae of the same species, some individuals readily ovipositing in naked pupae, such as the pupae of *Pieris rapae*, L., but other females interesting themselves only in pupae within real or artificial cocoons. A number of species differing widely in size and habit were successfully parasitised.

BRYANT (G. E.). **Two new injurious Phytophaga from East Africa (Coleopt.)**—*Proc. R. ent. Soc. Lond.* (B) **6** pt. 8 pp. 159–160. London, 14th August 1937.

Descriptions are given of the Eumolpid, *Menius gossypii*, sp. n., feeding on bracts of cotton bolls, and the Galerucid, *Monolepta pruni*, sp. n., feeding on leaves of plum and apple, both in Uganda.

CANN (F. R.). **Insect Damage in Timber and Wooden Exhibits in Museums.**—*Mus. J.* **37** no. 6 pp. 281-291, 4 pls., 8 refs. London, September 1937.

This is a survey of the wood-boring beetles that may cause damage in museums, with short descriptions and notes on their life-histories and on the usual methods of control.

SHEPARD (H. H.), LINDGREN (D. L.) & THOMAS (E. L.). **The relative Toxicity of Insect Fumigants.**—*Tech. Bull. Minn. agric. Exp. Sta.* no. 120, 23 pp., 4 figs., 39 refs. [St. Paul, Minn.] April 1937.

The history of fumigation against insects in stored products is briefly reviewed from the literature, and the equipment used for the determination of toxicities reported in this bulletin and the procedure followed are described. In comparing fumigants, the exposure used was 5 hours and the temperature 25°C. (77°F.). The median lethal dosages for *Tribolium confusum*, Duv., *Calandra* (*Sitophilus*) *granaria*, L., and *C.* (*S.*) *oryzae*, L., of 16 fumigants in commercial use are given in a table. A formula is quoted for the calculation of the dosage necessary to kill high percentages of an insect from those necessary to kill 50 and 90 per cent. A figure so calculated is more accurate than one obtained by observation. A second table gives the dosages of the same fumigants, as calculated by this method, necessary to kill 99 per cent. of the three species. Both sets of data indicate that the order of toxicity of the fumigants may differ greatly for species showing considerable structural differences, such as *T. confusum* and *C. granaria*, whereas, with few exceptions, it is the same for closely related species, such as *C. granaria* and *C. oryzae*. Repetitions of a mortality curve show different degrees of variation in the case of different insects and fumigants. *T. confusum* appears to be a comparatively satisfactory test insect. Mortality curves for different fumigants are not necessarily parallel, they may even cross. The external factors that affect toxicity most are temperature and moisture; such internal factors as the stage of development are also important. Survivors of various exposures to chloropicrin and ethylene dichloride placed in flour were kept for eight months, and in most cases produced numerous progeny. Notes are given on the relative merits of the various fumigants.

The relative toxicity to *T. confusum* and *C. granaria* of 15 new compounds, chiefly chlorinated chemicals, are tabulated. Some are more toxic than chloropicrin, the median lethal dosage of which for *T. confusum* is 4·6 mg. per litre. These include acetyl, propionyl and thionyl chlorides, but these are probably too active chemically to be suitable for use as fumigants. Dichlorethyl ether is very toxic, but has a high boiling point and is retained by fumigated products. The median lethal doses for *T. confusum* of dichlorethylene (symmetrical *cis* form), trichlorethylene and tetrachlorethylene were 154, 108, and

55 mg. per litre respectively, whereas those of dichlormethane (methylene chloride), trichlormethane (chloroform) and tetrachlormethane (carbon tetrachloride) are 82, 157 and 185. Methyl thiocyanate (1·6 mg.) is more toxic to *T. confusum* than chloropicrin and nearly as toxic as hydrocyanic acid gas (0·6 mg.), but its boiling point is higher than is desirable.

The relative susceptibility of 6 species of Coleoptera to 3 fumigants is examined. There appears to be a fairly consistent correlation between susceptibility and the requirement of a high temperature for development. The effect of temperature changes upon the toxicity of 4 fumigants to *T. confusum* was also studied. The highest concentration of each was required at 10°C. [50°F.]. At lower temperatures, the effects of two toxic agents may be combined. Although a temperature of 0°C. [32°F.] by itself produces 50 per cent. mortality only after some days, the amount of chloropicrin required to give this mortality by its own action at 25°C. gave the same mortality at 0°C. in 5 hours. Ethylene dichloride is very little affected by the change in temperature from 20 to 35°C. [68 to 95°F.], particularly when median lethal concentrations are compared. Surface adsorption on treated products is greater at lower temperatures [**16** 327]. It is possible that the increase in adsorption more than sets off the increased efficiency of fumigants at temperatures below 10°C.

The efficiency of a liquid fumigant is affected by its vapour pressure. Mass movement by air currents is largely responsible for equalising the gas concentration in a room. Molecular diffusion also takes place, but more slowly. The diffusion is most rapid in the case of gases of small molecular weight, such as hydrocyanic acid gas, carbon dioxide and ethylene oxide. Diffusion is of great importance in the penetration of furniture, package goods, etc. The adsorptive capacity of a product must be satisfied before a constant concentration can be maintained in the surrounding atmosphere. The concentration of ethylene dichloride necessary to kill various percentages of *T. confusum* at different temperatures in a flask containing no adsorptive material and in others containing a layer of wheat or flour is given. The insects were hung in cages about 3 ins. above the flour or wheat. The median lethal concentration of ethylene dichloride in the presence of wheat appeared to be about twice, and in the presence of flour about 8 times, that in the empty flasks. The outward rate of diffusion of a fumigant after ventilation is begun, depends upon the same factors as the inward diffusion. Since rather low concentrations of toxic gas may be lethal if the exposure is long enough, a fumigant that penetrates slowly may be retained sufficiently to be effective in killing insects within the treated product.

BATCHELDER (C. H.), QUESTEL (D. D.) & TURNER (N.). **European Corn Borer Investigations. Experiments with Insecticides on early Sweet Corn.**—*Bull. Conn. agric. exp. Sta.* no. 395 pp. 274–285, 5 figs., 1 ref. New Haven, Conn., June 1937.

This is a progress report of investigations on the effectiveness of preparations of fixed nicotine, rotenone and thiodiphenylamine (phenothiazine) against the first generation of *Pyrausta nubilalis*, Hb., on early sweet maize in Connecticut. Details are given of the methods of preparing the various insecticides. Preliminary experiments by Batchelder and Questel had established that some fixed-nicotine sprays were toxic to the larvae, particularly when applied with a suitable spreader to the growing whorls of leaves during the period in which the eggs were hatching; and that substantial protection to early sweet maize in commercial fields could be given by these sprays.

The number of larvae surviving treatment (measured by dissection of the stalks and ears of a sample of 10 plants from each plot) and the percentage of ears free from borers after treatment with insecticides were compared with similar data from untreated plots. Each treatment was replicated 4 or 6 times in a random Latin square arrangement, and applications were made on the same date in each field experiment. Treatments were started when hatching was first observed in the field, and subsequent applications were made at intervals of about 5 days during the hatching period, but adjusted on account of the rains. The total number in each year was four. In 1936 rains not only prevented the application of insecticides on appropriate days, but also greatly reduced the period of their effectiveness. These conditions tested the weathering capacity of the insecticides severely. Taking the control experiment as standard, sprays of nicotine tannate (0·062 per cent. nicotine), a derris extract (0·02 per cent. rotenone) and ground derris (0·018 per cent. rotenone), all with a spreader of ammonium sulpho-soap, and 0·48 per cent. thiodiphenylamine with butyl phenylphenol sodium sulphonate as spreader, reduced the number of borers in the ears by 78·6, 71·4, 87·6 and 88·8 per cent. and in the plants by 68·7, 72·1, 88·0 and 89·2 per cent., respectively, in 1935. In 1936 the nicotine tannate and thiodiphenylamine and also ground derris (0·02 per cent. rotenone) were all employed with a spreader of butyl phenyl-phenol sodium sulphonate and reduced the number of borers in the ears by 87·5 per cent. and in the plants by 89·8, 92·4 and 82·2 per cent., respectively. Dusts of derris, thiodiphenylamine and nicotine tannate were unsatisfactory, but commercial control was given by a new dual-fixed nicotine, prepared by mixing nicotine tannate dried on kaolin with nicotine sulphate dried on bentonite and applied with a talc carrier. None of the materials tested in an attempt to develop a suitable dry concentrate of fixed nicotine that could be stored before use as a spray withstood weathering satisfactorily, nor did a concentrate of nicotine and tannin in alcohol provide protection equivalent to that of the standard nicotine tannate.

TURNER (N.). **Insecticides to control the European Corn Borer.**—*Circ. Conn. agric. Exp. Sta.* no. 118 pp. 13–16, 1 fig. New Haven, Conn., April 1937.

This paper contains very brief notes on the bionomics of *Pyrausta nubilalis*, Hb., on maize in Connecticut, and on mechanical methods of control. For early maturing maize, sprays containing derris, thiodiphenylamine (phenothiazine) and nicotine tannate are recommended on the basis of recent experiments [see preceding paper].

CENDAÑA (S. M.). **Studies on the Biology of** *Coccophagus* **(Hymenoptera) a Genus parasitic on nondiaspidine Coccidae.**—*Univ. Calif. Publ. Ent.* **6** no. 14 pp. 337–399, 1 pl., 46 figs., 19 refs. Berkeley, Calif., 6th May 1937.

FLANDERS (S. E.). **Ovipositional Instincts and Developmental Sex Differences in the Genus** *Coccophagus*.—*T.c.* no. 15 pp. 401–422, 7 figs., 31 refs.

The following is largely taken from the author's summary of the first paper, which gives an account of experiments carried out in

California : Extensive studies were made of the biology of *Coccophagus gurneyi*, Comp., *C. ochraceus*, How., *C. trifasciatus*, Comp., and *C. scutellaris*, Dalm., and less detailed ones of *C. modestus* var. *capensis*, Comp. All these Aphelinids lay their eggs in the coelomic cavity of their Coccid hosts, except *C. ochraceus*, which deposits them on the ventral surface of the host. Three larval instars were observed in all except *C. capensis*, in which the number was not definitely determined. The instars differed in the size of the head case, the degree of development of the respiratory system, the number of body segments, and certain other features. All the species are internal parasites except *C. ochraceus*, which feeds externally during the first two instars, but later enters the viscera of the host. *C. gurneyi* and *C. ochraceus* consume the internal organs and pupate in the empty shell of the host ; they cast the last larval skin before pupation. *C. trifasciatus*, *C. scutellaris* and *C. capensis* avoid injury to the vital organs of the host, pupate before it dies, and retain their last larval skin as a pupal shroud. Superparasitism occurs in all the species studied. In *C. ochraceus* the surplus larvae are eliminated by active competition for the possession of the host ; in the other species, phagocytosis seems to be the chief eliminating factor. Inhibited hatching is described [*cf. R.A.E.*, A **24** 664] ; the larva fails to hatch although it continues to live for a prolonged period, remaining enclosed in an egg membrane which becomes very distended. This phenomenon, which occurs in *C. gurneyi* and *C. trifasciatus*, results when the female parasite has not mated before oviposition [it is pointed out in a foot-note that the cause is explained in the second paper].

C. gurneyi is a parasite of *Pseudococcus gahani*, Green. The observed minimum durations of the three instars at 28°C. [82·4°F.] are 4, 3, and 3 days, respectively. The pupal stage averages 11 days, and the life-history 33·3 days. *C. gurneyi* oviposits freely in several species of mealybug. It develops with some success in *P. longispinus*, Targ., and rarely in *Phenacoccus gossypii*, Tns. & Ckll. The eggs are destroyed by phagocytes in *Pseudococcus citri*, Risso, and *P. maritimus*, Ehrh., and generally in *Phenacoccus gossypii*.

C. ochraceus parasitises young *Saissetia oleae*, Bern., and *S. hemisphaerica*, Targ. In summer, the average period of development for the male is 35·3 days, and for the female 27·3 days. The three instars last 3–4, 4, and 4–5 days respectively, and the pupal period averages 11·3 days for the male and 11 days for the female.

C. trifasciatus, an African species, parasitises young *S. oleae*. The average period of development is 50·2 days.

C. scutellaris is a parasite of several species of Lecaniine scales ; *Coccus hesperidum*, L., was the host in these studies. The calculated probable minimum lengths of the three instars are 4, 4 and 3 days, respectively. The pupal period averages 6·47 days and total development 28·02 days. Up to four parasites may develop in each host.

Coccophagus capensis is a parasite of the late third-instar of *S. oleae* and *S. nigra*, Nietn. On *S. oleae*, the eggs are laid in the " rubber-stage " scales. The life history is similar to that of *C. trifasciatus*.

In the second paper, an account is given of work already noticed [**24** 547, 664] on bisexual development in several species of *Coccophagus*, the males of which are secondary parasites.

Diseases, Insects, and other Pests injurious to Plants.—*Bienn. Rep. Kans. agric. Exp. Sta.* **8** (1934–36) pp. 90–106. Manhattan, Kans., 1937.

The bulk of this section deals with work on insect pests carried out in Kansas from July 1934 to June 1936. Lists are given of the insects that were more than usually plentiful in both 1934–35 and 1935–36, and of those that were scarce in 1934–35. Studies during the summers of 1934 and 1935 showed that a soil temperature of 118°F. was not lethal to the larger insects. The rate of respiration of *Melanoplus differentialis*, Thomas, increased from 33 times a minute at normal temperatures to 93–111 times a minute after exposure to a soil temperature of 144°F. for 20 minutes. It then declined to a few times a minute and death occurred. Eggs of chinch bugs [*Blissus leucopterus*, Say] were killed at a soil temperature of 145°F. ; the population of chinch bugs actually declined during the summer. Temperatures behind the leaf sheaths of maize (the habitat of young chinch bugs) were 105–115°F. on hot days. Experiments in a greenhouse showed that the optimum moisture for *Agrotis ypsilon*, Hfn., in the soil employed was 25–30 per cent. of the dry weight of the soil ; with 58 per cent. moisture larvae develop normally but all die in the prepupal and pupal stages ; the minimum water content necessary for development is less than 5 per cent. These limits probably do not apply to soils with different capacities for holding water. *A. ypsilon* is potentially a pest throughout the United States.

In the autumn and spring of 1935–36, wheat in the east of Kansas was severely infested by the Hessian fly [*Mayetiola destructor*, Say], and in some fields about 70 per cent. of the plants were killed. In the western part of the infested area, the spring generation was greatly reduced by frost or drought (or both) in April. In 1935, adults were observed on the experimental plot from 6th to 19th April ; there was no evidence of a summer generation, but an early and a late autumn generation occurred. Counts of eggs on spring wheat showed that 30 per cent. of the plants of one variety, and 7 per cent. of another were infested. Wheat appears to pass through a period of especial susceptibility to attack by the wheat stem maggot [*Meromyza americana*, Fitch]. In 1935 an early drought, followed by rains in May and June led to a second growth of late culms on many wheat plants. As a result of the infestation of these, the usual relationship between the planting date and infestation by the spring brood was disturbed. Observations in 1934 showed that *Blissus leucopterus* deposited more eggs along the margin of a field and in areas on high ground where the wheat was thin than in wheat on low ground, which was lodged later. On migration the bugs went either to greener wheat in the same field or to adjacent fields of maize and late oats. The presence of the succulent stubble of lodged green wheat in which they could live for a time prolonged the period of migration. The bugs appeared to be distributed throughout the field wherever the growth was not rank enough to produce a damp dark environment at the bases of the plants. Recommendations are made on the most efficient form of repellent barriers for protecting maize from the migrating nymphs, as a result of extensive experiment in 1934 on the heavy infestations that occurred in that year. Creosote, pine tar and naphthalene drain oil each proved more effective in that order when employed alone than when diluted with fuel oil or other repellents.

Pine tar retained its effectiveness for a longer time than other repellents ; naphthalene drain oil repelled the bugs when first applied but on windy days lost its efficiency in about 2 hours. In mixtures, the effectiveness of the repellents was determined by the proportion of each. At dilutions greater than 1 : 5 two applications were generally required.

In one district injury to both sweet and field maize by the corn earworm [*Heliothis armigera*, Hb.] approached 100 per cent. In tests to find a mechanical contrivance to confine the larvae to the tip of the ear, the use of paper husks was unsatisfactory, but good results were given by a cord or light wire tied tightly round the ear below the tip of the cob just after the silk emerged. In the same district there was an extensive outbreak of the leaf-miners, *Ceradontha denticornis*, Mg. (*dorsalis*, Lw.) and *Agromyza parvicornis*, Lw., during the spring of 1935 ; they attacked young maize in the two or four-leaf stage, retarding its growth by the destruction of one or more leaves.

In 1934, several cryolites all gave better control of the codling moth [*Cydia pomonella*, L.] on apple than astringent lead arsenate or manganese arsenate. In 1935, lead arsenate with summer oil, with pine tar soap, with Vatsol or alone, and calcium and magnesium arsenates, gave control in that order. During 1934 and 1935, severe damage was done to red-bud trees [*Cercis canadensis*] by the leaf-folding larvae of *Gelechia cercerisella*, Chamb., and several trees were killed. This moth has 2–4 generations during the year and hibernates in the pupal stage in fallen leaves. A spray of lead arsenate with summer oil applied in April and again a month later is recommended for control. *Aphis pawneepae*, Hottes, appeared on medium-sized branches of red wood in one locality in 1934 and 1935, probably forced above ground by the dry condition of the soil. Parasites liberated during 1934–36 included *Macrocentrus ancylivorus*, Rohw., against the strawberry leaf-roller (*Ancylis comptana*, Froel.) and the oriental fruit moth [*Cydia molesta*, Busck] ; *Ascogaster carpocapsae*, Vier., against *C. pomonella* ; and *Aphelinus mali*, Hald., against the woolly apple aphis [*Eriosoma lanigerum*, Hsm.]. *M. ancylivorus* has become established in one district.

Excavations in cultivated areas and in prairie sod showed that the heaviest population of white grubs [*Lachnosterna*] occurred where vegetation was most plentiful and where the soil was not exposed to direct sunlight throughout the summer. In the Augusts of 1934 and 1935, white grubs descended deeper into the soil than in previous seasons of greater rainfall and lower soil temperature, and in September and October they were found at an average depth of 15 ins. in soils unprotected from high temperatures. For 2 weeks in 1934–35 the soil was frozen to a depth of 24 ins., and 15 per cent. of white grubs taken in the surface foot were killed by frost. Data on the movement of wireworms [*cf*. *R.A.E.*, A **24** 12] show that they probably only travel far enough to obtain food. Wireworms reared from the egg in 1930 were apparently full grown in 1934, but not all of them had pupated at the time of writing. Newly hatched wireworms were unable to withstand temperatures of 105 and 111°F.

In 1934, there were two generations of the migratory grasshopper [*Melanoplus mexicanus*, Sauss.] and, for the first time, of the two-lined grasshopper [*M. bivittatus*, Say]. In 1935, both species oviposited in bare parts of lucerne fields, in stubble fields, and along the roadsides and margins of fields ; the differential grasshopper [*M. differentialis*] in clumps of grass; and packard and red-legged grasshoppers [*M. packardi*, Scudd., and *M. femur-rubrum*, DeG.] in fields and grassland.

The normal population of *Chorizagrotis auxiliaris*, Grote, concentrated on the green patches in a poor crop of lucerne and grass in the spring of 1935, and so caused some damage. In 1936, *Feltia subgothica*, Haw., an allied species, was dominant. Lucerne flowers, in mid-August 1935, were infested with an average of 1·44 thrips per blossom. An outbreak of *Loxostege sticticalis*, L. [*cf.* **24** 560] was chiefly on sugar-beet and Russian thistle [*Salsola pestifer*], but lucerne was attacked when there were many thistles in the field. Alfalfa yellows, which is carried by leafhoppers, was widespread, and seeds were severely affected. The alfalfa seed Chalcid [*Bruchophagus gibbus*, Boh.] was abundant during the year.

According to collections made twice a week since 1933 from 3 kinds of grass pasture land, the Jassid population was uniform on the whole, but the number of each species varied considerably: the population of *Laevicephalus striatus*, L., dropped from 13,746 in 1934 to 21 in 1935, whereas that of *Cicadula divisa*, Uhl., the vector of aster yellows, increased from 267 in 1934 to 6,200 in 1935. The numbers of *Polyamia inimica*, Say, one of the chief leafhopper pests of grasses, were practically stable for the 3 years. About 90 per cent. of approximately 8,000 insects reared from hibernation in samples of grass stems were *Harmolita* spp. and *Eurytoma* spp. and their parasites. Chloropids [*cf.* **24** 533], Cecidomyiids, Coccids and various Dipterous and Neuropterous predators constituted the remaining 10 per cent. The Hispid, *Anisostena bicolor*, Smith, mined the leaves of *Tripsacum dactyloides*, and Coleopterous larvae, including *Centrinaspis furtiva*, Casey, injured the culms of bluestem grasses.

The strawberry leaf-roller, *Ancylis comptana*, overwinters as a larva and pupates in late March and early April. Adults emerge in late April and oviposit. The abnormal weather in 1935, cool in April and May and hot and dry in July and August, led to long incubation periods; of 100 individuals reared from egg to adult, the egg, larval and pupal stages averaged 30·88, 27·58 and 9·41 days, respectively. For the second generation, the corresponding periods were 5·5, 20·5 and 6·3 days. During 1934, 4 Hymenopterous parasites, *Catolaccus aeneoviridis*, Gir., *Perilampus fulvicornis*, Ashm., *Spilochalcis torvina*, Cress., and a Bethylid, *Perisierola* sp., not previously recorded from this leaf-roller, were reared. Strawberries in one locality were severely infested with *Empria* (*Harpiphorus*) *maculata*, Nort., in May 1935. Proprietary dusts containing pyrethrum and rotenone were applied, and the latter proved effective. Complete control of the sawfly was given by a spray of lead arsenate (1½ lb. in 50 U.S. gals. water).

Work is reviewed on the resistance of varieties and hybrids of *Sorghum* and maize to *Blissus leucopterus*, maize to *Heliothis armigera*, wheat to *Mayetiola destructor*, and lucerne to the pea aphis [*Macrosiphum onobrychis*, Boy.].

McLaine (L. S.) & Munro (H. A. U.). **Developments in Vacuum Fumigation at the Port of Montreal.**—*Rep. ent. Soc. Ont.* **67** (1936) pp. 15–17, 1 ref. Toronto, 1937.

Consignments of broom corn for importation into Canada have hitherto been shipped through Boston or New York and there subjected to steam sterilisation, which effectively destroys all insect life in them but damages the corn. Following the establishment of a vacuum fumigation plant at Montreal, experiments were undertaken in an attempt to substitute some type of fumigation that would kill the insects without injury to the corn. Complete mortality of larvae of the corn borer [*Pyrausta nubilalis*, Hb.] placed among broom corn stalks was obtained by exposure for 3 hours to dosages of between 8 and 64 oz. hydrocyanic acid gas per 1,000 cu. ft., with an initial vacuum of 29·5 ins., which was reduced to approximately 28·5 ins. after the introduction of the gas, the tank and commodity temperatures varying from 60 to 70°F. An exposure of 3 hours to 2½ lb. HCN per 1,000 cu. ft. with an initial vacuum of 28 ins. was equally effective, at temperatures above 70°F., against *Pyrausta* larvae placed in shipments of Argentine broom corn accepted for treatment in this way. To determine whether larvae exposed temporarily to low temperatures before fumigation were equally susceptible, bundles of maize stalks and broom corn, either naturally infested or artificially stocked with about 30 larvae in gelatine capsules, were kept at 10°F. for 7, 14 and 21 days and fumigated at 70–90°F. immediately afterwards ; the mortality rate was 96, 96 and 76 per cent. respectively. Complete mortality was obtained if the larvae were removed from cold storage and kept at 50–54°F. for 1 or more days before fumigation.

It is the present policy never to fumigate bales of broom corn until their entire interior is warmed to 60°F. or over, and during the actual process the tank temperature is maintained as close as possible to 90°F. Regulations for handling broom corn between 15th November and 31st March stipulate that it be transported from New York or Boston in heated cars maintaining an air temperature of not less than 55°F., and that, if it has to be stored prior to delivery at the fumigation plant, the storage space must be maintained at a temperature of not less than 60°F.

In preliminary experiments with a proprietary fumigant containing, by weight, approximately 7 per cent. methyl bromide and 93 per cent. carbon dioxide, the mixture was used at the rate of 40 lb. (2·8 lb. CH_3Br.) per 1,000 cu. ft. *Pyrausta* larvae infesting table maize were exposed for 90 minutes ; on removal from the fumigation tank they appeared very sluggish, and all died within 24 hours. An exposure of 2 hours was equally effective against apple maggots [*Rhagoletis pomonella*, Walsh] and codling moth larvae [*Cydia pomonella*, L.] in the centre of infested apples. The results of analysis of fumigated vegetables, which are given in a table, show that the methyl bromide combines to a very limited extent with the plant substance to yield bromine, which is, however, soluble in water and would be largely eliminated by cooking. Further work is being done on the effect of methyl bromide, with and without carbon dioxide, on fumigated material.

KELSALL (A.) & STULTZ (H. T.). **Pyrethrum and Derris Dust.**—*Rep. ent. Soc. Ont.* **67** (1936) pp. 20–29. Toronto, 1937.

An account is given of laboratory experiments, sometimes supplemented by field tests, on the comparative efficiency of derris and pyrethrum dusts, containing not less than 3·95 per cent. rotenone and 0·94 per cent. total pyrethrins, respectively, against insect pests in

Canada. The methods and apparatus used are described in the following paper; the diluent in each case was gypsum.

The mortality rates of larvae of *Hyphantria cunea*, Drury, within 10 days of treatment with 15 per cent. pyrethrum and within 5 days with 50 per cent. were 60 and 100 per cent., respectively. Derris somewhat reduced feeding, but at concentrations of 25 and 100 per cent. the percentage mortality in 5 days was only 20. The percentage mortalities of *Malacosoma americana*, F., within 7 days of treatment with 15, 30 and 45 per cent. pyrethrum were 52, 84 and 100, and with 5, 12½ and 25 per cent. derris 0, 28 and 92, respectively. Within 36 hours of treatment with 1, 5, 10, 15 and 30 per cent. pyrethrum, the mortality rates of *Stilpnotia salicis*, L., were 0, 10, 30, 85 and 100 per cent., respectively. Derris was quite ineffective at concentrations of 25 per cent. In field tests, the larvae on poplars were destroyed by applications of 30 per cent. pyrethrum. The percentage mortalities of *Eulia mariana*, Fern., on apple were 70 and 40 in 8 days, and 100 and 100 in 5 days with 15, 30, 50 and 100 per cent. pyrethrum, respectively, and 20 and 10 in 8 days, and 40 and 40 in 5 days with 5, 12½, 25 and 100 per cent. derris. Field tests were not satisfactory. In 2 days, the percentage mortalities of *Nephelodes emmedonia*, Cram., were 96 with 30 per cent. pyrethrum and 21 with 10 per cent. derris. After 2 weeks all the larvae treated with pyrethrum were dead, but many of those treated with derris were still alive. In 2 days, the percentage mortalities of *Pieris rapae*, L., on cabbage, were 67 with 1 per cent. pyrethrum, 100 with 5 per cent. pyrethrum and 5 per cent. derris, and only 80 with 12½ per cent. derris. Further tests with 5 and 12½ per cent. derris, however, gave 67 and 100 per cent. mortality, respectively, in 1 day. In the field, both 15 per cent. pyrethrum and 5 per cent. derris gave excellent results, and lower concentrations were equally effective if applied thoroughly. Within 2 days, the percentage mortalities of *Plusia* (*Autographa*) *brassicae*, Riley, on cabbage, were 67 with 1 per cent., and 100 with 5 per cent. pyrethrum; within 1 day, 75 and 80 with 15 and 30 per cent. pyrethrum, and 33 and 50 with 5 and 12½ per cent. derris. In field tests, excellent control was obtained with pyrethrum and fair results with derris. The percentage mortalities of *Plutella maculipennis*, Curt., were 83, 100, 0 and 40 with 15 and 30 per cent. pyrethrum and 5 and 12½ per cent. derris, respectively, in one day. Field tests suggested that pyrethrum would be effective in concentrations that were lethal for *Plusia brassicae*.

The percentage mortalities of *Pteronus* (*Pteronidea*) *ribesii*, Scop., on currants, were 20, 35, 100 and 100 within 2 days of treatment with 15 and 30 per cent. pyrethrum and 5 and 12½ per cent. derris, respectively, and 70, 70, 90 and 91 within 3 days of treatment with 0·25, 0·50, 1 and 2½ per cent. derris. In field tests, pyrethrum was generally effective only when applied heavily at concentrations of 30 per cent. or over, while 2·5 per cent. derris gave excellent control and prevented reinfestation for 3 weeks.

Derris or pyrethrum at concentrations of 5 per cent. or more gave 100 per cent. mortality of adults of *Epitrix cucumeris*, Harr., within 45 minutes, but these results were not thought to be altogether conclusive, as dead insects could not be distinguished from stupefied ones, and there was a high mortality rate amongst control insects kept for 2 days. Two days after dusting areas of lightly infested potatoes with 15 and 30 per cent. pyrethrum, the beetles were fairly numerous, but practically none could be found after

5 per cent. derris had been used. A very heavy infestation on tomatos was effectively controlled by 10 per cent. derris, no beetles being present two days later. After ten days, the plants were slightly reinfested. The percentage mortalities within 4 days of adults of *Leptinotarsa decemlineata*, Say, were 20 and 80 with 5 per cent. pyrethrum and derris, and 100 with 15 and 30 per cent. pyrethrum and 2½ and 12½ per cent. derris. Those of the larvae were 0 and 40 with 0·5 and 1 per cent. pyrethrum and 100 with 5 per cent. pyrethrum and 5 per cent. derris. In field tests, 15 per cent. pyrethrum and 5 per cent. derris, applied at the rate of approximately 80 lb. per acre, both gave satisfactory control of the beetles on potato. Lower concentrations were not satisfactory. In field experiments against *Phyllotreta albionica*, Lec., on mangels, the numbers of beetles on plots dusted with 30 and 100 per cent. pyrethrum were reduced, after 2 days, to about 20 per cent. of those on the control plots, while only a few remained on those dusted with 10 per cent. derris. Plots treated with 30 and 100 per cent. derris contained practically no beetles. Five days after treatment, the beetle population on the pyrethrum-treated plots was 16 times greater than on those treated with derris, where only a few beetles remained. Within 3 days, the percentage mortality rates of *Anthonomus signatus*, Say, were 60 with 50 per cent. pyrethrum, and 100 with 15, 30 and 45 per cent. pyrethrum and 5, 12½ and 25 per cent. derris ; and in further experiments they were 100, 62 and 88 with 5, 15 and 30 per cent. pyrethrum, and 90, 80 and 90 with 2·5, 5 and 12½ per cent. derris, respectively. Applications of 30 per cent. pyrethrum gave satisfactory control of the weevils on strawberries in the field, but reinfestation from outside sources took place. The same dust, applied at the rate of 100 lb. per acre, gave excellent control of the weevils on extensive areas of raspberries, although they were found in small numbers after 3 weeks. The crop of berries was much the largest ever harvested from these holdings. The percentage mortalities of *Diabrotica vittata*, F., within one day, were 60, 60, 90 and 100, respectively, with 0·5, 1, 5 and 15 per cent. pyrethrum, and 20, 80 and 100 with 1, 2·5, and 5 per cent. derris. In field tests, both derris and pyrethrum gave satisfactory control but reinfestation was more rapid after pyrethrum.

The percentage mortalities of *Brevicoryne brassicae*, L., within 2 days of treatment with 5, 15, 30, 45 and 100 per cent. pyrethrum, and 12½, 25 and 50 per cent. derris, were 25, 60, 70, 90 and 100, and 5, 10 and 20, respectively. On cabbage in the field, thorough dusting with pyrethrum at concentrations of 30 per cent. or more gave good results, but severe reinfestation took place within 3 weeks. Derris appeared unsatisfactory. *Euscelis striatulus*, Fall., newly hatched black-headed fire-worm [*Rhopobota naevana*, Hb.], and a number of unidentified Geometrids infesting cranberry bogs were all controlled by 30 per cent. pyrethrum applied at the rate of 100 lb. per acre. An orchard of 60 apple trees infested with adults of *Lygus communis*, Knight, was dusted with 30 per cent. pyrethrum at the rate of 60 lb. per acre. The insects dropped from the trees soon after dusting, and although they remained alive for some time, nearly all were dead on the following day. Many rosy Aphids [*Anuraphis roseus*, Baker] on the same trees were also brought down by the dust, but all were alive and moving about the next day. *Ceresa bubalus*, F., on small apple trees appeared to be completely controlled by 30 and 50 per cent. pyrethrum. White apple leafhopper [*Typhlocyba pomaria*, McAtee] was also brought down by the dusts, although death did not occur as rapidly as in the Membracids. Neither species was affected by 25 per cent. derris. An infestation of *Lygus pratensis*, L., most of which were in the nymphal stage, on greenhouse chrysanthemums was completely controlled in 2½ hours by 100 per cent. pyrethrum, which also killed woodlice. On pear trees infested with *Psylla pyricola*, Först., 30 per cent. pyrethrum was effective against the nymphs in 24 hours, and 25 per cent. derris had given good control after two weeks. Most of the adults flew away, and those that fell to the ground recovered later.

Experiments on the persistence of toxicity of derris and pyrethrum were carried out principally on *Leptinotarsa decemlineata*, although some observations were also made on other insects. The methods used are briefly described. The toxicity of derris was considerably more persistent than that of pyrethrum. The persistence of toxicity of both was positively correlated with the thickness of the dust film and with concentration, and negatively correlated with exposure to sunlight. On 6 hours' exposure to sunshine and temperatures of 74–83°F., 15 per cent. derris lost most of its toxicity and 15 per cent. pyrethrum lost all. At 55–68°F. and 8 hours' exposure to sunlight, 100 per cent. pyrethrum lost most of its toxicity in 24 hours. In the shade at 55–83°F., 15 per cent. derris lost most of its toxicity in 24 hours, but 25 per cent. derris retained a good deal after 50 hours and some after 100. With 42 hours' exposure to sunshine and temperatures of 45–73°F., 100 per cent. derris showed considerable toxicity after 168 hours. Derris remained toxic to some susceptible insects, such as *Pteronus ribesii*, for as long as 3 weeks.

The toxicity of derris and pyrethrum that had been mixed with hydrated lime and then stored in the dark for various periods was tested on *L. decemlineata*. For as long as 16 days, the toxicity of pyrethrum mixed with lime was equal to that of pyrethrum mixed with gypsum, but it then decreased more rapidly, although after 68 days it was still high. The difference was further accentuated after 3 months, though the pyrethrum with lime was still toxic. In a 3 months' test with mixtures of derris with lime or gypsum, there appeared to be no difference in the rate of deterioration. Some inconsistent results were, however, obtained, and all the mixtures are being tested for longer periods of storage.

PAYNE (S. H.) & STULTZ (H. T.). **A Laboratory Apparatus for determining the relative Toxicity of Contact Dusts.**—*Rep. ent. Soc. Ont.* **67** (1936) pp. 30–33, 1 fig. Toronto, 1937.

A description is given of an apparatus designed for testing contact dusts on insects ; it consists essentially of a closed dusting chamber into which a known quantity of dust may be injected at a controllable rate and force, and subsequently distributed evenly over the area to be dusted. It enables a series of dust films to be laid down or successive dustings of a uniform density to be applied. Insects may be either dusted directly by the dust falling from above, or brought into contact with a film of dust on a prepared plate.

CAESAR (L.). **The European Corn Borer in Ontario in 1936.**—*Rep. ent. Soc. Ont.* **67** (1936) pp. 33–35. Toronto, 1937.

The infestation of maize by *Pyrausta nubilalis*, Hb., in Ontario in 1936 is compared with that in previous years [*cf. R.A.E.*, A **25** 367, etc.]. Early maize in the south-western part of the province seemed to be considerably more heavily infested than that planted a week or so later, the increase in some districts being as great as 55 per cent. There was great variation in the incidence of attack, which is attributed partly to climatic conditions. In the county of Norfolk, where there was a prolonged drought, only 3·7 per cent. of the plants were affected.

GOBLE (H. W.). **The Sweet Clover Weevil.**—*Rep. ent. Soc. Ont.* **67** (1936) pp. 35–37. Toronto, 1937.

Surveys in the spring and early summer of 1936 showed that *Sitona cylindricollis*, Fhs., was very widely distributed on sweet clover [*Melilotus*] in south-eastern Ontario [*cf. R.A.E.*, A **25** 368]. The only other plants attacked were alsike clover [*Trifolium alexandrinum*] and, apparently, black medick [*Medicago lupulina*], and these were little damaged in the presence of sweet clover. Adults in outdoor cages emerged from hibernation at the end of April, those in the fields a few days later, and began feeding almost at once. Pairing was observed commonly from 1–2 weeks after emergence until the end of May, and intermittently until early August. The overwintered adults died in late July or early August. Oviposition lasted from the middle of May until at least the end of June, and during this period the amount of feeding was reduced. The eggs appeared to be laid indiscriminately on the surface of the soil beneath the plants, and the larvae lived in the soil to a depth of 6 inches, feeding on the small roots and root hairs. In sandy ground most of them were full-grown at the end of June, and in heavy soil a week or so later. Pupation takes place in a loose-textured pocket in the soil. Adults emerged from 25th June until well into August, and fed on foliage until hibernation began in October, but apparently laid no eggs until the following spring. In the autumn of 1935, sweet clover was seriously damaged by the newly emerged weevils, but in 1936 there was a great decrease in their numbers, evidently the result of some natural factor. All the eggs in the insectary and those brought in from the field had failed to hatch, though mating had been so conspicuous that they were almost certainly fertile ; and the larvae were much less abundant than had been expected. Their numbers may have been reduced by lack of moisture, or partly by predators, especially Carabids. There was no evidence of disease.

In experiments on control, a lead arsenate dust, sprays of lead arsenate and of barium fluosilicate, both with and without molasses, and poison baits were all ineffective. Dusting with equal parts of barium fluosilicate and talc appeared to give commercial control, but the weevils reinfested the plants. It is suggested that cutting the clover in early bloom, harvesting it as hay and ploughing the stubble well in immediately afterwards might prove an effective method of control.

PALM (C. E.). **A Report on the Alfalfa Snout Beetle,** *Brachyrhinus ligustici* **L., in New York.**—*Rep. ent. Soc. Ont.* **67** (1936) pp. 37–40, 1 ref. Toronto, 1937.

Notes are given on the bionomics and control of *Otiorrhynchus* (*Brachyrrhinus*) *ligustici*, L., infesting lucerne and other plants in New York [*cf. R.A.E.*, A **25** 179]. Field injury was much less in

1936 than in previous years ; migrations of the weevils were checked and many were killed by the extensive use of the bait of sodium fluosilicate, raisins and shorts [*cf.* **19** 528 ; **25** 180], of which over 110,000 lb. were distributed. This was the most efficient of the baits tested, but one of 100 lb. cracked maize, 5 lb. sodium fluosilicate and 2–3 U.S. gals. waste honey compared favourably with it. In preliminary experiments with the Nematode, *Neoplectana chresima*, a high percentage of the larvae of *O. ligustici* was parasitised at 75°F. The most important predator is the skunk, the number of larval remains in the digestive tract of a male and a female being 271 and 182, respectively, and in 2 U.S. quarts of skunk faeces 925.

MALTAIS (J. B.). **Resistance of some Varieties of Peas to the Pea Aphid *Illinoia pisi* Kalt.**—*Rep. ent. Soc. Ont.* **67** (1936) pp. 40–45, 3 figs. Toronto, 1937.

For the 4 years 1933–36 inclusive, tests have been carried out in Quebec on the resistance of 17 varieties of standard canning peas to *Macrosiphum onobrychis*, Boy. (*Illinoia pisi*, Kalt.), an additional 5 varieties being tested in 1936. Each variety was grown on separate plots of about 200 sq. ft. on well-drained clay soil, all being given the same treatment every year. From the time the Aphids migrated to the young plants, about the first week in July, until just after harvesting, 10 random samples of terminal growths from each variety were collected twice weekly, and every other day in 1936, and the Aphids present counted. Counting was simplified by exposing the vials containing the samples to strong sunlight for about 10 minutes, as most of the Aphids left the food-plant and collected on the moist inner surface of the glass, where they died from the intense heat. In 1933 and 1934, the mean population reached its maximum on 24th and 25th July, respectively, and little damage was done to the crop. In 1935, the population was much lower, but it reached its maximum on 11th July when the pea pods were forming, and damage was rather severe. In 1936, the average population was rather low throughout July and very little damage was done. This was probably due to the relatively cool wet weather. A graph shows the average Aphid population on the 17 varieties tested from 1933 to 1935, the figures being based on the total population in 10 samples. The average numbers of Aphids per sample on 3 susceptible and 4 resistant varieties for 3 consecutive seasons were 53·9, 61·6, 63·6, 10·9, 12·3, 24·7 and 24·2, respectively, and on 4 susceptible and 4 resistant varieties in 1936, 21·8, 19·8, 22·4, 21·3, 7, 9·4, 7·8 and 6. Early varieties, whether susceptible or not, are not as a rule subject to injury, as the pods generally form before the Aphids are numerous ; a graph shows that the relative length of the time of growth is not, however, a factor of resistance.

HALL (J. A.). **Observations on the Biology of the Apple Maggot.**—*Rep. ent. Soc. Ont.* **67** (1936) pp. 46–53, 6 figs. Toronto, 1937.

Investigations have been carried out since 1933 on the factors affecting the emergence of the apple maggot [*Rhagoletis pomonella*, Walsh] and the length of its pre-oviposition period in a county in south-western Ontario that borders on Lake Erie. Initial difficulties in breeding the flies were overcome when they were concentrated in numbers, regularly exposed to sunlight, and supplied with water, sugar (generally in the form of raisins and honey), and yeast. There were 2 generations annually, and in a sandy loam soil, the emergence period of the overwintered brood lasted from 19th or 27th June until 7th August or 7th September, varying in the different years from 44 to 77 days and averaging 59. The peak of emergence usually occurred during the third week of July, and not more than 2 per cent. of the adults of this brood emerged after 1st August in any season. Adults of the first brood emerged from 18th September to 14th October. The variety of apple in which the larvae fed affected the time of their maturity, those in the early ripening apples maturing first. From 0·02 to 10·5 per cent. of the early maturing larvae gave rise to adults in the same year, but none from the later varieties did so. All first-brood flies were derived from larvae that reached maturity before 20th August, but all of these larvae did not necessarily give rise to adults in the same season. There was some indication that the emergence of adults, in the year following that in which the larvae matured, was rather earlier for those derived from summer varieties than for those from later ones, but the evidence was inconclusive [*cf. R.A.E.*, A **23** 373]. Between the times of larval maturity and the emergence of the flies, the mortality rate appeared to be influenced by the variety of apple and in 1935 varied from 73 to 90·4 per cent. in 5 varieties tested.

The cultivation of infested sandy loam soil did not hasten or retard the time of emergence [*cf.* **23** 655], but cultivation carried out once in April, 5 times in April and May, and 9 times in April, May and June increased the numbers emerging by 3, 21·7 and 20·6 per cent., respectively. This increase was probably due to conservation of the water in the soil, which would prevent desiccation of the pupae, and to the loosening of the soil, which would allow greater numbers to emerge, and thus more than offset the number of pupae destroyed. To determine the effect of rain on the emergence of adults, cages containing known numbers of pupae were roofed over, and sufficient water to saturate the soil to a depth of 4 ins. was applied in some each week from early spring to the end of the emergence period. The number of adults emerging in these cages was 12 per cent. greater, the emergence period was slightly longer and the peak of emergence slightly later than in cages kept under dry conditions. The emergence of flies of the overwintered brood took place on days with mean temperatures of 64·3–87·7°F., those above 70°F. appearing to be most favourable. The first-brood adults emerged on days with mean temperatures varying from 34·3 to 73·9°F., even if the minimum was as low as 25°F. In the early part of the emergence period, the ratio of females to males was sometimes 5 : 1, but later the numbers were about equal and the males predominated towards the end of the period [*cf.* **21** 331]. Females were rather more numerous than males in both broods. Larvae maturing in any season may give rise to adults in that and the 3 successive years ; for 60,922 larvae observed, the percentage emergence in each year was 0·92, 25·81, 0·58 and 0·04, respectively.

Under varying weather conditions and with several varieties of apples, the minimum, maximum and average lengths of the pre-oviposition period in 26 cases were 4, 14 and 8 days, respectively. With mature apples of one variety and with the less mature fruits of another, the periods averaged 5·4 and 8 days, respectively.

Oviposition in certain other fruits, such as hawthorn, was delayed until they were nearly mature.

KELSALL (A.) & PICKETT (A. D.). **Results from organized Apple Maggot Control in Nova Scotia.**—*Rep. ent. Soc. Ont.* **67** (1936) pp. 53–55. Toronto, 1937.

The Nova Scotia Apple Maggot Control Act of 1931, which prescribes measures for the control of the apple maggot [*Rhagoletis pomonella*, Walsh], is administered by an independent board of fruit growers and includes within its jurisdiction an area, known as the large zone, extending for about 85 miles from Annapolis Royal to Windsor, and varying from 4 to 20 miles in width, which is organised as a unit for control purposes. The results of work in this area are reviewed. Control measures are prescribed for all infested properties, with which are now included those potentially infested. The practical result of the spray requirements is that, in commercial orchards, 2 arsenical sprays are applied after the calyx spray. If 3 post-blossom sprays are applied at intervals of 10–14 days, even though the last be applied no later than early July, the fruit carries a satisfactory load of arsenic throughout the period of infestation, and at picking time complies with arsenic tolerance requirements without washing. Two sprays must be applied in early and mid-July, or slightly later, to apple trees that are not sprayed regularly. In all cases the sprays consist of 3 lb. lead arsenate in 100 gals., or the equivalent of other arsenicals.

Fallen apples of soft varieties, such as Gravenstein, must be collected frequently. Frequent collection of the hard winter apples is not enforced, but all fruit must be picked up after harvest, and must at all times be disposed of so that the maggots are destroyed, though dumps of apples are sometimes permitted in forested areas at a considerable distance from the orchards. All apples within 300 yards of an infested orchard must be either removed or treated as though infested.

Apples produced outside the large control zone may not enter it except under permit, and must be packed in approved containers and handled so that there is no opportunity for waste apples to become distributed. Refuse, such as peelings and cores, from factories, has to be treated as fallen apples, and is sometimes sterilised by steaming.

Of the 5,359, 5,368, 5,509 and 5,424 properties visited in 1933, 1934, 1935 and 1936, respectively, 1,152, 985, 524 and 333 were infested. The percentages of orchards reported clean that were infested the previous year were 54 in 1933, 42 in 1934, 64 in 1935 and 72 in 1936. The numbers of new infestations found each year represented 45, 45, 36 and 48 per cent. of the total infestations.

MCANDREWS (A. H.). **Notes on the European Pine Shoot Moth** (*Rhyacionia buoliana* **Schiff.**).—*Rep. ent. Soc. Ont.* **67** (1936) pp. 56–57. Toronto, 1937.

Since 1931, observations have been made on an infestation by *Rhyacionia buoliana*, Schiff., of a 10-acre plantation of several species of pines in central New York. The trees, which are thought to have become infested about 1926, ranged from 1 to 10 ft. in height. The site and drainage were poor, with a steep western exposure, and the upper slopes were covered with a pure stand of Norway spruce [*Picea abies*]. Infestation did not appear to be heavier on the poorer sites, although the growth is slower; the buds are smaller, so that a given number of larvae will destroy more buds than on a good site, and injury is more obvious on account of slower recovery [*cf. R.A.E.*, A **21** 567]. Some species were more susceptible to attack than others, and some suffered more damage even when the larval population per 100 buds was the same. Ability to recover was also very variable; that of red pine [*Pinus resinosa*] was very poor, while Scots [*P. sylvestris*] and jack pine [*P. banksiana*], which were as badly damaged, recovered readily. The foliage of severely injured red pine was sometimes abnormal, so that the trees were difficult to identify. White pine [*P. strobus*] was the least heavily attacked, although adults were reared from it both in the field and in the laboratory. The mortality rate, however, was high, and the females were small, with a subnormal number of eggs. It is thought unlikely that injury to this species by *R. buoliana* will ever be serious.

Prevailing winds at the time of flight continually carried the moths into the Norway spruce, and spruce buds, injured in 1934, were found to contain dead larvae, while in 1935 living larvae were found. No moths emerged from buds caged in the field, although two dead ones were found in them. Three rather small adults of *R. buoliana* emerged from buds brought into the laboratory but died without ovipositing. In 1936 no new infestation could be found on spruce. Further examination showed that unsuccessful attacks had occurred before 1934, but that damage by the spruce gall louse [*Chermes abietis*, L.] and a needle miner had disfigured the foliage and helped to conceal the other injury.

PATTERSON (D. F.). **Four Years' Experience with "Electracide" Light Traps.**—*Rep. ent. Soc. Ont.* **67** (1936) pp. 57–61, 2 figs., 1 ref. Toronto, 1937.

Since 1933, tests have been carried out on the value of electrocuting light-traps for the control of *Cydia* (*Carpocapsa*) *pomonella*, L., on apple in Ontario. The trap consisted essentially of a 75-watt Mazda lamp surrounded by a grid, alternate bars of which carried opposite charges of electricity at 4,000 volts, so arranged that when an insect attracted by the light came into contact with any 2 adjacent bars it received the full force of the current. In 1933, 24 traps were used, one in every 4th tree of a block of apples. In subsequent years, 49 traps were used and the block reduced in size with all but 3 trees lighted. In 1933 no lead arsenate was applied to the lighted block after the first cover spray, and in the succeeding years none after the second. The adjacent unlighted part of the orchard was used as a control and received 4 cover sprays in 1933 and 1936, and 5 in 1934 and 1935. The percentage reductions of injured fruit as compared with the control were 14·7, 20·9, 38·8 and 9·1 in the 4 successive years. From 17th June to 25th September 1933, 1,602 moths were caught in the 24 traps; and from 29th May to 27th September 1934, 1st June to 8th September 1935, and 2nd June to 9th September 1936, 1,705, 479 and 490 moths, respectively, in the 25 traps from which records were made. Practically no moths were trapped at temperatures below 60°F., and the greatest numbers were taken during the second half-hour after sunset and on trees adjacent to others that were unlighted.

Oviposition cages [*R.A.E.*, A **20** 181] were used to test the influence of lights on *C. pomonella* and the oriental fruit moth [*C. molesta*, Busck], but there was no significant reduction in the number of eggs laid in cages near them.

DUSTAN (A. G.). **A brief Report on certain Mercury Salts used experimentally against the Onion Maggot.**—*Rep. ent. Soc. Ont.* **67** (1936) pp. 62–63. Toronto, 1937.

In 1935, experiments with mercury salts were begun in an attempt to find an effective substitute for lubricating oil sprays [*cf. R.A.E.*, A **19** 317 ; **21** 287, etc.], which are difficult to prepare and apply, for the control of the onion maggot [*Hylemyia antiqua*, Mg.] in Canada. In 1936, each substance was tested on 3 randomised plots 53 ft. long, comprising 3 rows each, on light sandy soil where severe infestation occurs annually. Applications were made on 25th May, when the eggs were first noticed in the field, and on 1st, 8th and 15th June. The insecticides were mixed with water in a wooden tub, and the liquid was poured from enamelware vessels over the seedlings so that the soil was thoroughly wetted to a depth of 1 in. and to a distance of 2 ins. on either side of the row. At the same time, the control rows were moistened with tap water so that they were equally attractive to the flies, which prefer to oviposit in damp soil. The degree of control was ascertained by counting the number of dead seedlings in all rows 3 times weekly until about the end of July, when the plants were large enough to be able to withstand attack.

Applications of methyl mercury chloride (CH_3HgCl), 1 part in 4,800 parts water, and mercurous chloride, mercury bichloride and a proprietary mixture containing 34 per cent. mercury bichloride and 66 per cent. mercurous chloride, all at 1 part in 960 parts water, reduced the percentage of dead seedlings from 23·2 in the controls to 9·2, 10·6, 3·7 and 3·3, respectively, the last 2 being commercially satisfactory. The addition of 2 tablespoons of sulphite lye (lignin pitch) for every ounce of mercurous chloride greatly improved the suspension of the powder. In a field of onions in similar soil and at a distance of 100 ft., which received identical cultural treatment and 5 applications of a 2½ per cent. lubricating oil spray, only 2·9 per cent. of the plants were killed.

McLEOD (J. H.). **Some Factors in the Control of the common Greenhouse Aphid,** *Myzus persicae* **Sulzer, by the Parasite** *Aphidius phorodontis* **Ashm.**—*Rep. ent. Soc. Ont.* **67** (1936) pp. 63–64. Toronto, 1937.

Preliminary attempts to introduce the Braconid, *Aphidius phorodontis*, Ashm., into a greenhouse for the control of *Myzus persicae*, Sulz., in Ontario, were made in the winter of 1932–33, and a good measure of control was obtained [*cf. R.A.E.*, A **24** 147]. Continued investigations have shown that the increase in the Aphid population is checked in January in one section of the greenhouse, and in April in another, slightly cooler part. Consideration of the temperature factors involved suggests that the most important one is the average 24-hour temperature and that *M. persicae* can probably be controlled by *A. phorodontis* in greenhouses where the average daily temperature is 65°F. or over.

Gilbert (H. A.) & Thompson (R. W.). **The Grasshopper Outbreak in Ontario in 1936.**—*Rep. ent. Soc. Ont.* **67** (1936) pp. 65–68, 1 ref. Toronto, 1937.

In 1936, outbreaks of grasshoppers in Ontario occurred on a few farms in Northumberland county and over about 2,000 acres in Manitoulin Island and 7,000 acres in Renfrew and Hastings counties. In these two counties, the two most abundant species were *Camnula pellucida*, Scudd., and *Melanoplus mexicanus mexicanus*, Sauss.; the latter is thought to have been the species recorded from the same area in 1935 as *M. angustipennis*, Dodge [*cf. R.A.E.*, A **25** 370]. Most of the eggs of these two species, which were laid in sod and stubble, respectively, hatched between 20th and 27th May, when the weather was very warm. In most places, abundant rain early in the year resulted in a good growth of grass, upon which the hoppers fed instead of migrating, as they do when the grass is scarce, to cereals in the early stages of development.

Effective control was obtained with poison baits, which in most cases consisted of a mixture of 12 lb. bran and the same bulk of fresh fine sawdust, 1 lb. salt and 2–3 gals. water, poisoned with 1¼ lb. sodium arsenate (30 or 50 per cent. As_2O_5) or 1 lb. white arsenic (90 per cent. As_2O_3). They were applied by hand at the rate of about 10 lb. per acre. Early tests suggested that sodium arsenate killed the young hoppers more rapidly than white arsenic, but later both appeared to be equally toxic. Altogether, about 2,500 lb. white arsenic and 8,000 lb. sodium arsenate were supplied for baiting approximately 9,000 acres, but in Manitoulin Island some of the poison was not used. White arsenic appeared to be more satisfactory there than sodium arsenate, but the baits were not distributed until July and August, when the grasshoppers were adult. Experimentally, white arsenic, sodium arsenate and Paris green appeared to be approximately equal in toxicity. In fine weather, baits made up with sawdust alone were almost as efficient as those that also contained bran, but in cool damp weather they were less attractive. It is suggested that attraction may vary with different types of sawdust. Rain and dew prolonged the effectiveness of the baits.

In a survey made in Renfrew county in the last week of September, no egg beds were found and even single egg pods were very scarce.

Mitchener (A. V.). **A Note on the Grasshopper Situation in Manitoba in 1936.**—*Rep. ent. Soc. Ont.* **67** (1936) pp. 68–69. Toronto, 1937.

Grasshopper eggs failed to hatch in the expected numbers in the spring of 1936 in most localities in Manitoba, and although hoppers slightly damaged young crops in some districts, they were not sufficiently numerous for bait to be applied. It is thought that the outbreak which began in 1931 has probably come to an end [*cf. R.A.E.*, A **25** 369].

Matthewman (W. G.). **Observations on the Life-history and Habits of the Columbine Borer.**—*Rep. ent. Soc. Ont.* **67** (1936) pp. 69–72, 7 refs. Toronto, 1937.

In the course of experiments on ovicides applied to the soil surface for the control of *Papaipema purpurifascia*, Grote & Rob., infesting cultivated *Aquilegia* in Ottawa, observations were made on the biology of this Noctuid. Hibernation occurs in the egg stage, and the larvae hatch early in May. They may enter the plants at almost any point above the ground but favour the tips of the young flower shoots. They may spend some time within the buds eating the leaves, but eventually enter the stem and feed on the tissues of the upper part until only a shell is left. The entrance hole is enlarged and is usually conspicuous, owing to the accumulation of frass. The larvae then work down to the crown, where they hollow out a chamber; the leaves of the infested stem begin to wilt and turn yellow, and the whole stem may break off. The infested part of the root begins to rot, and the interior becomes a slimy mass. Quantities of dark frass are often thrown out in the centre of the crown. The larvae mature towards the end of July and pupate in the fibrous roots and in the surrounding soil. By this time, small plants and larger ones containing several borers have generally died, but larger ones with only 1 or 2 borers may recover, although secondary attacks of millepedes and nematodes are likely to weaken them further, so that they fail to survive the winter. Towards the end of August, the moths emerge and begin to oviposit on the surface of the leaves, the eggs falling to the ground [*cf. R.A.E.*, A **23** 168]. In the field, the durations of the larval and pupal stages averaged 12 and 3–4 weeks, respectively. Caged moths lived for an average of 15 days. At room temperature and at constant temperatures of approximately 60 and 82°F., the incubation period was 8–14, 15 and 6 days, respectively. Of 100 moths reared in the insectary, 54 were females.

WATERSTON (J. M.). **Report of the Plant Pathologist, 1936. 1st October to 31st December.**—*Rep. Dep. Agric. Bermuda 1936* pp. 22–27. Hamilton, 1937.

During 1936, the parasites, *Physcus* sp. and *Encarsia portoricensis*, How., were recovered from all infestations of *Comstockiella sabalis*, Comst., on palmetto (*Sabal bermudana*) that were examined in Bermuda [*cf. R.A.E.*, A **23** 112]. Towards the end of the year, the parasites tended to lag behind the scale in its advance into the central leaves of the palm. Where the bud was infested, the injured leaves were removed and the bud wiped with kerosene emulsion. *Chrysomphalus agavis*, Tns. & Ckll., was frequently but not invariably found associated with disease in *Juniperus bermudiana*. In many cases, the exit holes of the parasites, *Aphytis* (*Aphelinus*) *diaspidis*, How., and *Aspidiotiphagus citrinus*, Cwfd., were present. Larvae of *Feltia* sp. and *Xylomyges* sp. caused widespread damage to potatoes, beans, and beets during the summer. Other pests that occurred during the year included *Calpodes ethlius*, Cram., on *Canna*; *Dialeurodes citrifolii*, Morg., and *Lepidosaphes beckii*, Newm., on neglected *Citrus*; *Orthezia insignis*, Dougl., on *Coleus*; *Eucosma* (*Spilonota*) *smithiana*, Wlsm., and *Ceratitis capitata*, Wied., which was scarce, on guava; *Aulacaspis pentagona*, Targ., on oleander; and *Icerya purchasi*, Mask., which did severe damage to old *Pittosporum* hedges in October but was controlled by *Rodolia cardinalis*, Muls.

REYNE (A.). *Monomorium destructor* **Jerd. als schadelijk insect in huizen.** [*M. destructor* as a Pest in Houses.]—*Ent. Meded. Ned. Ind.* **3** no. 3 pp. 50–52. Buitenzorg, 1st September 1937.

Referring to a note on insect injury to the insulation of electric cables in the Netherlands Indies [*R.A.E.*, A **25** 508], the author records cases of short-circuit in electric-light installations at Menado, Celebes, due to *Monomorium destructor*, Jerd., which heaped up material inside the switches and injured the insulation. He also found this ant boring small circular holes near cracks in an old cement floor and similar instances of boring in cement were reported to him. From Paramaribo, Dutch Guiana, he received specimens of an ant, apparently *M. destructor*, that had nested in electric-light installations in houses. At Paramaribo, attempts to control the ants with a poison syrup were unsuccessful, but they were eventually driven away by applying creoline or diluted carbolic acid to their run-ways.

A broca e a vespa. [*Stephanoderes hampei* and *Prorops nasuta*.]—*O Biologico* **3** no. 8 pp. 217–219. S. Paulo, August 1937.

Though the introduced Bethylid [*Prorops nasuta*, Wtstn.] is of considerable value in the control of the coffee berry borer [*Stephanoderes hampei*, Ferr.] in São Paulo [*cf. R.A.E.*, A **23** 364], it is only so if its numbers are maintained by artificial rearing during the time between seasons of coffee production, when host material (coffee berries infested by *Stephanoderes*) is scarce in the plantations. An adequate supply is obtained by carrying out the chief preventive measure advised against the pest, namely the collection of all berries that have not been picked or that are lying on the ground.

Fonseca (J. P.). **Processo para a multiplicação da "Vespa de Uganda" em viveiros.** [A Method for multiplying the Uganda Parasite in Breeding Apparatus.]—*O Biologico* **3** no. 8 pp. 220–229, 8 figs. S. Paulo, August 1937.

The Bethylid [*Prorops nasuta*, Wtstn.] is easily reared for the control of *Stephanoderes* [*hampei*, Ferr.] on coffee in São Paulo in wooden boxes through holes in one side of which glass funnels leading into test-tubes are fixed. On emergence, the adult parasites enter the tubes, and are confined singly with infested berries under other tubes placed upside down on a table. After oviposition, the berries are transferred to the breeding-boxes. The berries must be kept moist during the process, and to avoid fermentation, not more than 500 should be placed in a box.

Blanchard (E. E.). **Apuntes sobre calcidoideos argentinos, nuevos y conocidos.** [Notes on Argentine Chalcidoids, new and known.]—*Rev. Soc. ent. argent.* **8** (1936) pp. 7–32, 9 figs. Buenos Aires [1937].

This paper comprises records from Argentina of 28 Chalcidoid parasites, the hosts of which are given. The species described as new are: *Eurytoma camaromyiae*, bred from the galls of the Trypetid, *Camaromyia bullans*, Wied.; the Encyrtid, *Lepidaphycus* (gen. n.) *bosqi*, from larvae of the Coccinellids, *Eriopis connexa*, Germ., and *Cycloneda* (*Neda*) *sanguinea*, L.; *Litomastix brethesi*, from larvae of *Plusia nu*, Gn.; *Signiphora xanthographa*, from *Aleurothrixus floccosus*, Mask., and *A. howardi*, Quaint.; *Ablerus molestus*, from pupae of a species of *Leucopis* that attacks *Ceroplastes irregularis*, Ckll.; *Monodontomerus vianai* and *Horismenus distinguendus*, both from *Pimpla* (*Parapechtis*) *bazani*, Blanch., an Ichneumonid parasite of *Alabama argillacea*, Hb. ; *H. patagonensis*, bred together with an unidentified Cecidomyiid from *Stipa humilis* ; *Tetrastichus lopezi*, from *Apanteles williamsoni*, Blanch. [*R.A.E.*, A **25** 166], a parasite of *Tatochila autodice*, Hb. ; and *Tetrastichus pseudoeceticola* from *Oeceticus kirbyi*, Guild.

SLOAN (W. J. S.). **Seedling Pests of Cotton and their Control.**—*Qd agric. J.* **47** pt. 6 pp. 538-541. Brisbane, June 1937.

Brief notes are given on the following pests of seedling cotton in Queensland : *Aphis gossypii*, Glov., which feeds on the lower surface of the leaves, distorting them and sometimes killing the central shoot ; *Thrips tabaci*, Lind., which may destroy the entire terminal bud so that the plant produces only two thick cotyledons ; Jassids of the genus *Empoasca*, which if numerous may kill the foliage and sometimes the entire seedling ; several species of grasshoppers, the most troublesome being *Phaulacridium gemini*, Sjöst., and *Valanga irregularis*, Wlk. ; the cotton flea-beetles, *Podagrica* (*Nisotra*) *breweri*, Baly, and *P.* (*N.*) *submetallica*, Blkb., which also attack native plants allied to cotton ; *Heliothis armigera*, Hb. (*obsoleta*, F.), which frequently migrates to cotton from other crops and weeds ; *Loxostege affinitalis*, Led. [*cf. R.A.E.*, A **25** 347] ; *Euxoa radians*, Gn. [**22** 138] ; and *Dasus macleayi*, Blkb. Control measures are discussed generally.

Insect Pests and their Control.—*Agric. Gaz. N.S.W.* **48** pt. 7 pp. 398–401, 6 figs. Sydney, 1st July 1937.

This part of a series on insect pests in New South Wales [*cf. R.A.E.*, A **25** 379] includes notes on the control of *Taeniothrips simplex*, Morison. Among the measures recommended [**24** 211] is the use of a dust of 1 lb. derris and 8 lb. kaolin or talc on *Gladiolus* in the field.

VINSON (J.). **Les larves des coléoptères lamellicornes de l'île Maurice.**—*Rev. agric. Maurice* no. 92 pp. 68–70, 8 figs., 3 refs. Port Louis, 1937.

A key and figures are given for the identification of the genera of the larvae of Lamellicorns that commonly occur in sugar-cane fields in Mauritius, either as pests or in association with the manures used in cultivation.

REGNARD (P.). **Mission entomologique à Madagascar en 1936.**—*Rev. agric. Maurice* no. 93 pp. 93–96. Port Louis, 1937.

An account is given of the collection in Madagascar from August to December 1936 of Tachinids parasitising adults of *Enaria melanictera*, Klug, and their dispatch to Mauritius, together with details of the breeding technique employed. Over a million adults of this Melolonthid were collected, of which 18,547 (1·78 per cent.) were parasitised. The maximum number of Tachinid puparia in any one host was 8 and the average 2·74 ; altogether, 50,802 were dispatched to Mauritius. Eggs about to hatch were dissected out from adult Tachinids captured in the field and the resulting larvae successfully used for artificial infestations of *Enaria*. Attempts to infest other Coleoptera failed. The larval stage of the parasite lasted about a week. In experiments carried out in September on the effect of cold storage on the length of the pupal period, using batches of 11 or 12 puparia, the durations in 2 control batches kept at temperatures varying from 18 to 26°C. [64·4–78·8°F.] averaged 9·5 and 9·4 days, while for batches kept at 11–17°C. [51·8–62·6°F.] for 4, 7, 10 and 15 days, they averaged 12·5, 14·5, 17 and 21·5 days, respectively. In November at 20–29°C. [68–84·2°F.] for 2 batches of 10 puparia they averaged 7·3 and 7·9 days, and in batches of 6–10 kept at 11–17°C. for 4, 10, 12 and 17 days, they averaged 11·5, 16·6, 18·7 and 21·9 days, respectively.

A search for parasites of adults of other Melolonthids and Dynastids, and of Lamellicorn larvae was unsuccessful, although more than 1,000 larvae were examined.

MOUTIA (L. A.). **Notes sur l'introduction, la distribution et l'élevage de la mouche tachinaire importée de Madagascar, d'août à décembre 1936.**—*Rev. agric. Maurice* no. 93 pp. 97–100. Port Louis, 1937.

From the 50,802 puparia of Tachinid parasites of *Enaria* sent from Madagascar to Mauritius [see previous paper], 18,690 normal adults were obtained, the average mortality being 63·4 per cent. Flies kept in captivity and fed on a mixture of sugar and honey did not pair, and none of the many adults of *Lachnosterna* (*Phytalus*) [*smithi*, Arr.] placed in the breeding cages was parasitised. A total of 17,079 Tachinids was liberated in Mauritius; the localities and dates of distribution are shown in tables.

JACK (R. W.). **Division of Entomology, Annual Report for Year 1936. Agricultural.**—*Rhod. agric. J.* **34** no. 7 pp. 570–576; also in *Bull. Minist. Agric.* [*S. Rhodesia*] no. 1037 pp. 1–7. Salisbury, July 1937.

Swarms of *Nomadacris septemfasciata*, Serv., were present throughout the year 1936 in Southern Rhodesia, and the campaign against the hoppers extended from February to the end of May, although only 3 districts were affected before March. As sprays may be dangerous to stock and are very difficult to apply for the control of hoppers hatching amongst growing crops, a bait of maize meal, molasses and sodium arsenite was tested. The quantity of poison applied per acre was less than when sprays are used, and the results obtained were promising.

In experiments, streak disease of maize was transmitted by *Cicadulina mbila*, Naudé, but not by *C. zeae*, China; both Jassids were found together on infected maize in the field.

Other insect pests included the Tenebrionids, *Emyon tristis*, Fhs., and *Dasus* (*Gonocephalum*) *simplex*, F., attacking uncovered grain and seedlings of maize; *Systates exaptus* Mshl., and *Tanymecus destructor*, Mshl., on seedling cowpeas; *S. exaptus*, and *Mimaulus testudo*, Schönh., on sunn hemp [*Crotalaria juncea*]; *Hellula undalis*, F., and *Crocidolomia binotalis*, Zell., on crucifers; *Tachardina affluens*, Brain, on *Dodonaea* sp.; *Phaedonia areata*, F., on *Indigofera endecaphylla*; *Rhizoglyphus echinopus*, F. & R., in lily bulbs; *Bruchus centromaculatus*, All., *Pachymerus cassiae*, Gyll., and *P. pallidus*, Ol., in seed pods of *Cassia*; *B. rhodesianus*, Pic, in seeds of *Cajanus indicus* imported from India; and the Membracid, *Oxyrachis gibbulus*, Mel., on *Albizzia*.

TSENG (Shen) & HO (Chun). **Some Insects injurious to Pear-trees.**—*Lingnan Sci. J.* **16** nos. 2–3 pp. 249–259, 457–461, 3 pls., 13 refs. Canton, 1937.

An account is given of the bionomics of the Gryllid, *Calyptotrypus hibinonis*, Mats., the Pentatomid, *Urochela luteovaria*, Dist., and the weevil, *Rhynchites heros*, Roel., on pear in the district of Tsingtao (Shantung), and all stages of each are described. They all have only one generation a year.

Calyptotrypus hibinonis, Mats., feeds on the leaves, flowers and fruit and punctures the bark for oviposition. The egg stage lasts from mid-September to June, nymphal development, including 5 instars, is completed in about ten weeks, and the adults live for about three. The females lay 50–100 eggs. Feeding takes place in the evening; in experiments at least 16 species of food-plants were readily accepted. Only the surface of the pear leaves is eaten, but holes are often cut through the skin of the fruit. Usually only males are attracted to light traps. Control measures include winter pruning and destruction of branches containing eggs, shaking the nymphs from the trees in July and August, and spraying with lead arsenate.

Urochela luteovaria, which attacks the leaves, twigs, flower-buds and fruits, weakens the tree and causes the fruits to drop, as well as deforming them by the secretion of some toxic fluid. In the Tsingtao district, it has been observed only on pears and prefers trees between 20 and 30 years old. The nymphs hibernate under the bark in the second instar [*cf. R.A.E.*, A **23** 88] and resume activity in late March or early April. The third, fourth and fifth instars each last about 3 weeks, and the adults appear in June and live for about 150 days. Eggs are laid in late September or early October within a glue-like substance in cracks in the bark and hatch in 7–10 days. Some control is given by scraping the bark of the trees; the effect lasts for 3 years, but the treatment should only be applied every 8 years or the growth of the tree may be retarded. Satisfactory control has been obtained with various contact sprays, including emulsions of oil or carbolic acid.

Rhynchites heros oviposits in pears and then partly severs the stalk of the fruit, causing it to drop prematurely. It overwinters in the adult stage (in the pupal cocoon) or occasionally in the larval stage; the first adults have emerged before mid-April and the oviposition period of about 50 days begins in late May. The female lays 5–76 eggs, which hatch in 6–7 days. The larval period of 17–21 days is passed within the fruit, the first instar lasting 3 days. The prepupal and pupal stages occupy about 80 and 28 days, respectively, and are passed in a cocoon in the soil. The eggs are attacked by mites, and larvae by a fungus. The weevils should be shaken from the trees and destroyed. The fruits can be effectively protected by wrapping them in paper.

CHEN (Kia-ziang) & CHANG (Jo-chih). **A Survey on the Damage of the late Variety of Rice caused by Rice Borers at Kashing in 1935 and 1936.** [*In Chinese.*]—*Ent. & Phytopath.* **5** no. 4–6 pp. 103–111, 2 graphs. Hangchow, 1937. (Abstr. in *Lingnan Sci. J.* **16** no. 3 p. 515. Canton, 22nd July 1937.)

The damage to late rice caused by rice borers in the Kashing district of Chekiang Province is estimated at about £189,000 in 1935 and about half this figure in 1936. Methods of calculating the loss are discussed.

CHIN (Shing-mu). **Preliminary Observations on the ovipositing Habits of** *Apriona rugicollis*, **Chev. (Col.).** [*In Chinese.*]—*Ent. & Phytopath.* **5** no. 3 pp. 47–50. Hangchow, 1937. (Abstr. in *Lingnan Sci. J.* **16** no. 3 p. 516. Canton, 22nd July 1937.)

The Lamiid, *Apriona rugicollis*, Chevr., causes severe injury to mulberry in China by mining in the twigs. The adults emerge in July and August, and oviposition continues from July to October; eggs are inserted singly into the twigs, and cuts are then made round the twigs above the eggs. Females lay 1–6 eggs daily. About 31 per cent. of the twigs are cut and are then liable to break off in high winds. The larvae bore in the twigs, retarding their growth and sometimes killing them. They hibernate within the twigs and pupate in late spring or early summer.

LI (Feng-swen). **On some Control Measures of the Cotton Insect Pests of China.** [*In Chinese.*]—*Ent. & Phytopath.* **5** no. 1 pp. 2–10. Hangchow, 1937. (Abstr. in *Lingnan Sci. J.* **16** no. 3 p. 523. Canton, 22nd July 1937.)

The author estimates that the total number of insect pests of cotton in China is 161, and that they cause an annual loss of about £12½ million. About 50 per cent. of this loss is due to *Platyedra* (*Pectinophora*) *gossypiella*, Saund., and about 20 per cent. to *Earias cupreoviridis*, Wlk. An account is given of control measures suitable for application in China.

SILAYAN (H. S.). **Annual Report of the Director of Plant Industry for the fiscal Year ending December 31, 1936.**—178 pp., 18 pls. Manila, Philipp. Dep. Agric. Comm., 1937.

Scattered sections of this report deal with insect pests and their control in the Philippine Islands in 1936. *Locusta migratoria manilensis*, Meyen, invaded Mindanao, the Visayan Islands, the Bicol region and southern Tegalog; isolated outbreaks occurred elsewhere, but in one reported from Palawan, the species involved was found to be *Melicodes tenebrosa*, Wlk. (*Acridium cognatum*, Stål). As in previous years, the infestation reached its peak in June, when it covered 38,600 acres in 24 provinces, and decreased during the height of the rainy season. An account is given of the anti-locust campaign, which was handicapped by lack of funds and of co-operation from landowners, and tables show the areas infested, the damage caused, and the apparatus and material used in each province. It was found that the sawdust from certain kinds of wood, which is coarser than that from first-class timber, could be successfully used instead of bagasse as a carrier for poison baits.

Among the other pests recorded, *Nephotettix bipunctatus*, F. (*apicalis*, F.) caused considerable damage to rice. In experiments on its control, a derris dust gave promising results. Maize was attacked by *Heliothis armigera*, Hb. (*Chloridea obsoleta*, F.), and in certain areas 60–70 per cent. of the plants were destroyed by *Pyrausta nubilalis*, Hb. Strawberry flowers in one district were heavily infested by a thrips that reduced the crop by 50 per cent. or more. In preliminary experiments against it on plants in pots, 0·4 per cent. soap solution containing 0·2 or 0·3 per cent. nicotine sulphate gave excellent control.

Studies in progress on a number of insects and the results of tests with insecticides containing derris, including some prepared from locally grown root containing about 3 per cent. rotenone, are very briefly reviewed. A spray of derris and soap was effective against *Prays citri*, Mill., which causes considerable damage to *Citrus*, especially the young fruits of imported varieties. Dust prepared from the local root gave rapid and complete mortality in the laboratory of *Toxoptera aurantii*, Boy. (black citrus aphis) and larvae of *Crocidolomia binotalis*, Zell. In tests on cotton, it gave promising results against larvae of *Cosmophila erosa*, Hb., and adults of *Dysdercus cingulatus*, F. (*megalopygus*, Breddin), and, when used with equal parts of a carrier, killed adults of *Amorphoidea lata*, Motsch., which is one of the most serious cotton pests in the Philippines. When used against a shade tree caterpillar, *Pericyma cruegeri*, Btlr., it gave 90 per cent. mortality within 2 hours and 100 within 3 days, and was also effective as a spray at a concentration of 0·6 per cent. with the addition of 0·6 per cent. soap.

During the year, *Trichogramma minutum*, Riley, was reared in large numbers and 66,000 were released, and liberations were also made of 345 Chinese Mantids, *Paratenodera sinensis*, Sauss.

A list is given of a number of insects intercepted on plants and plant materials imported from different countries.

CORBETT (G. H.). **Division of Entomology. Annual Report for the Year 1936.**—*Gen. Ser. Dep. Agric. S.S. & F.M.S.* no. 26 pp. 29–48, 5 graphs, Kuala Lumpur, 1937.

Observations on the predacious enemies of *Cosmopolites sordidus*, Germ., in Malaya [*cf. R.A.E.*, A **25** 195] were continued. Various unidentified Forficulids and an unidentified Staphylinid lived for several hundred days in the laboratory and consumed large numbers of eggs of the weevil. F. C. Hadden, searching for parasites for introduction into Hawaii against *Ceratitis capitata*, Wied., obtained *Opius fletcheri*, Silv., *Biosteres* (*O.*) *longicaudatus*, Ashm., *B.* (*O.*) *persulcatus*, Silv., *Tetrastichus* sp., *Syntomosphyrum* (*Melittobia*) *indicum*, Silv., *Galesus* sp., *Spalangia* sp., and *Tachinaephagus* sp., from pupae of *Dacus* (*Chaetodacus*) *ferrugineus*, F., and *O. fletcheri* from those of *D.* (*C.*) *cucurbitae*, Coq. Of 1,100 parasites of 3 species sent to Hawaii in March, only one male and one female of *O. fletcheri* and one male and twelve females of *B. persulcatus* arrived alive. From 15,000 pupae and 4,000 larvae of *D. ferrugineus* despatched from Singapore in July, numbers of parasites, representing 5 species, emerged at Honolulu.

Investigations at Serdang on the seasonal incidence of egg-masses of stem-borers on rice [*Diatraea auricilia*, Ddgn., and *Schoenobius bipunctifer*, Wlk.] confirmed the conclusions reached in previous years [*loc. cit.*], but the number of egg-masses recorded for May was the highest for that month, and that recorded for October was the highest for any month of the whole period. Yield was generally lower than in previous years, but there was no correlation between the number of egg-masses, the bored tillers and the yield. There was, however, a correlation between the number of egg-masses during the third month of growth and yield, suggesting that this is the important period. A similar investigation was started at Malacca in June 1936.

No egg-masses had been recorded on the plants by the end of the year, but some stems were bored, doubtless by larvae carried by wind. A rice reputed to be resistant to borers was received from China, and seeds sown on 30th January all germinated. The period from sowing to harvest occupied 107 days. The crop was good, although 97·5 per cent. of the stems were attacked by borers. A second sowing from original seed was made on 18th May, but germination was very poor, and sowing with first-generation seed was made on 5th June. The period required for development remained the same. Stem-borer attack amounted to 34 per cent. and a very good crop was obtained. In two areas, severe attacks by *Scotinophara coarctata*, F., were observed in association with *Diatraea*. *D. polychrysa*, Meyr., occurred in abundance on rice in one area in February. There was a severe outbreak of *Calandra oryzae*, L., in a rice mill in March ; much of the rice coming to the mill was already infested. Sunning for 8 hours failed to destroy the immature stages of *Rhizopertha dominica*, F., *Sitotroga cerealella*, Ol., and numerous other beetles, the maximum temperature obtained being 115°F. *Cuphocera varia*, F., *Gaediogonia jacobsoni*, Tns., and *Sturmia inconspicuoides*, Baranov, together parasitised about 29 per cent. of *Spodoptera mauritia*, Boisd. The Pentatomid, *Andrallus spinidens*, F., was observed as a predator but not in great numbers. Pyralids of the genus *Nymphula* were reported on rice in various districts and were mostly *N. fluctuosalis*, Zell., though one batch of larvae proved to be *N. depunctalis*, Gn. Draining off the water where possible, or failing this, spraying with derris gave complete control of *Sogata furcifera*, Horv. *Leptocorisa acuta*, Thnb., and *Cletus punctiger*, Dall., did considerable damage in late November and early December.

The yields of 60 acres of coconut palms that had been seriously attacked in 1932 by *Artona catoxantha*, Hmps., fell considerably in 1933, but rose in 1934 and 1935 to well above those of a similar unattacked plot. *Parasa lepida*, Cram., was recorded, for the first time in considerable numbers on coconuts, over a small area early in the year, but was heavily parasitised by *Apanteles parasae*, Rohw. ; and the Tachinid, *Chaetexorista javana*, Br. & Berg., an unidentified Ichneumonid and *Chrysis shanghaiensis*, Smith, were also obtained from the cocoons. The pupal period of *P. lepida* generally lasts 25–33 days, but can apparently be much longer, for adults continued to emerge after 101 days. *Chalcocelis albiguttata*, Snell., occurred sparsely over an area of about 1,000 acres of mature coconut palms early in the year. *Pestalozzia* following superficial injury by it was not so prevalent as in previous outbreaks. *Fornicia chalcoscelidis*, Wlkn., was recorded from the larvae, and *Chaetexorista javana* was also abundant. Pupae were apparently attacked by *Cordyceps* sp. and the larvae by some form of bacterial wilt. *Hidari irava*, Moore, occurred on coconut more extensively than ever before in Malaya, but the caterpillars were attacked by a bacterial wilt. The finding of *Artona catoxantha* in small numbers, for the first time, suggests that they are always present in those areas that suffer periodically from serious outbreaks. Larvae of *S. mauritia* bred from egg-masses collected from the leaves of coconut palms in a grass-covered area fed on grass but not on coconut leaves in the laboratory.

Mahasena corbetti, Tams, which had not previously been regarded as a pest, defoliated oil palms [*Elaeis guineënsis*] in two areas. In the laboratory, the larval period lasted 101–124 days, and the pupal period of the male 23–40 days. The Tachinids, *Tricholyga sorbillans*, Wied., *T. psychidarum*, Baranov, and *Sturmia inconspicuoides*, the Sarcophagids, *Sarcophaga fuscicauda*, Boettcher, and *S. antilope*, Boettcher, and unidentified Hymenoptera were recorded as parasites of *M. corbetti*. Various termites were taken in association with dead or fallen parts of oil palms, but only *Coptotermes curvignathus*, Holmgr., is known to attack healthy palms.

Tea was attacked by *Microtermes pallidus*, Hav. [**25** 45] in the lowlands, and by *Thosea biguttata*, Wlk., *Setora nitens*, Wlk., a Lymantriid, probably *Dasychira* sp., *Gracilaria theivora*, Wlsm., and *Helopeltis cinchonae*, Mann., in the highlands.

Oecophylla smaragdina, F., was introduced into one coffee estate for the control of *Cephonodes hylas*, L., the larvae of which, however, cause little injury if periodical collections are made. It only became established on bushes where scales, particularly *Coccus* (*Lecanium*) *viridis*, Green, were present, and through the protection it affords to these, bushes on which it is abundant are less healthy than others, as the predators, *Chilocorus politus*, Muls., and *Eublemma rubra*, Hmps., do not occur on them. This ant (which also causes annoyance to cultivators of coffee) may be controlled in 3 or 5 days, respectively, by putting half a teaspoonful of Paris green or lead arsenate into the nest. Keeping it off the bushes by banding the stems proved effective for the control of *C. viridis*, and *Saissetia* (*L.*) *nigra*, Nietn. Bands should be examined once a month, as a bark disease is apt to develop under them.

Hasora chromus, Cram. (*alexis*, F.) damaged *Derris* in a small area, and *Striglina scitaria*, Wlk., caused minor injury. Unidentified leaf-mining caterpillars caused the death of the apical portion of the leaves in several localities, but were heavily parasitised by a Braconid.

On the golf course in the Cameron Highlands, *Anomala aureola*, Hope, was not so prevalent as in 1935 [**25** 195], either as a result of an intensive campaign conducted from February to April or of mortality caused by the fungus, *Metarrhizium anisopliae*. Of 5 species of Scoliid parasites of the genus *Campsomeris* from various sources, only one, *Campsomeris prismatica*, Sm., brought from Fraser's Hill, was recovered. The beetles rest during the day on such plants as *Cyathea contaminans* and *Melastoma muticum*, from which they may easily be collected. They fly from about 6.30 to 7.30 p.m. and usually pair during this period. The females probably remain above ground for about 7 days before ovipositing, and during this period are attracted to light and scent traps. Maximum emergence occurs during the third week of March. Of 35 attractants tried, rose-geranium oil and eugenol-geraniol were the most promising; the maximum number of beetles attracted to a trap containing the former in one night was 62. In a light trap, 2,127 beetles were caught between 13th March and 30th April; the maximum in one night was 289 on 11th March. The grubs of a Melolonthid, *Hoplosternus* sp., which emerges from September to November, are generally distributed at the golf course at Fraser's Hill, but *C. prismatica* seems to exercise a natural control. The beetle has also been caught at light in the Cameron Highlands.

Miscellaneous records include *Idiocerus nitidulus*, Wlk., and *Hemithea costipunctata*, Moore, on young mango; *Heterographis bengalella*, Rag., on *Anona squamosa* (custard apple); *Dacus ferrugineus* on *Citrus*; *Egropa malayensis*, Dist., on *Anacardium occidentale* (cashew nut); *Lophobaris serratipes*, Mshl., on pepper [*Piper nigrum*]; *Asota*

(*Hypsa*) *alciphron*, Cram., on *Ficus* sp.; *Plusia* (*Phytometra*) *intermixta*, Warren, on *Crotalaria* and *Calopogonium*; and *Psara licarsisalis*, Wlk., on various grasses. A bait containing sodium arsenite and sugar sprayed over the nests controlled bees (*Apis indica*, F.), which are often troublesome in bungalows.

METALNIKOV (S.). **Utilisation des spores dans la lutte contre les insectes nuisibles.**—*C. R. Soc. Biol.* **125** no. 23 pp. 1020–1023, 1 ref., 1 fig. Paris, 1937.

Successful laboratory experiments have been carried out during the past ten years on the control of insect pests (chiefly Leipdopterous larvae) with dry spores of bacteria pathogenic to them, as well as field experiments in Jugoslavia and Hungary [*R.A.E.*, A **19** 150, 155, etc.]. The insects were killed as a result of eating leaves sprayed with suspensions of the spores. Preliminary field experiments in Egypt with 2–4 applications of a spray prepared from dry spores against *Platyedra* (*Gelechia*) *gossypiella*, Saund., on cotton gave encouraging results. During 1935–36, large numbers of dead or unhealthy caterpillars on vegetable crops were found to be infested with sporogenous bacteria, and spraying with a suspension of the dry spores in the open field killed all the larvae in 24–48 hours, whereas larvae on control plots were still feeding and healthy. Experiments on a large scale have recently been carried out in north-eastern France in vineyards heavily infested with larvae of two vine moths [*Sparganothis pilleriana*, Schiff., and *Clysia ambiguella*, Hb.]. The number of *S. pilleriana* on vines treated twice with spores was only 14·4 per cent. of that on untreated vines. In the south of France, complete control of Tortricid larvae on apple was obtained in 24 hours.

GRANDORI (R.). **Contro la tignola orientale del pesco** (*Cydia molesta*). **Consigli ai frutticultori mantovani.** [Measures against the Oriental Peach Moth. Advice to Fruit Growers in Mantua.]—*Boll. Zool. agr. Bachic. Milano* **7** (1936) pp. 171–188, 9 figs. Turin, 1937.

A decree dated 3rd March 1936 provided for the enforcement in the province of Mantua of such measures against *Cydia molesta*, Busck, infesting peach and pear, as may be required by the Phytopathological Observatory in Milan. It was not found possible to organise measures in 1936, but the author describes a programme of control considered likely to be effective.

GRANDORI (R.), PROVASOLI (L.) & MARIANI (G.). **Rifugi invernali delle larve di** *Cydia molesta* **e lotta contro di essa mediante l'acido cianidrico.** [Winter Quarters of the Larvae of *C. molesta* and Work against it by Means of Hydrocyanic Acid Gas.]—*Boll. Zool. agr. Bachic. Milano* **7** (1936) pp. 189–195. Turin, 1937.

Experience in Italy has shown an essential item in successful work against *Cydia molesta*, Busck, on peaches to be the destruction of the larvae hibernating in cocoons in their winter quarters, which include the boxes in which the fruit is stored and various fittings, etc., in the store-rooms [*cf.* *R.A.E.*, A **24** 514]. Experiments made early in 1937 to ascertain the quantity of sodium cyanide necessary for effective fumigation of fruit boxes with hydrocyanic acid gas showed that fumigation for 12 hours with 5 oz. sodium cyanide per 100 cu. ft. was insufficient. With 7 oz. per 100 cu. ft. and exposure for 15 hours at 11–13°C. [51·8–55·4°F.], 1 larva out of 43 recovered 5 days after fumigation. On the assumption that the resistance of the larvae depends chiefly on their ability to keep the stigmata closed for long periods, it was concluded that fumigation for 24 hours with 6 oz. per 100 cu. ft. should be effective, and this standard was adopted for practical work in 1937.

KÉLER (S.). **Przyczynek do znajomości pasożytów kwieciaka jabłoniowego** (*Anthonomus pomorum* **Linn.**). [Contribution to the Knowledge of the Parasites of the Apple Blossom Weevil.]—*Prace Wydz. Chor. Szkodn. Rośl. państw. Inst. nauk. Gosp. wiejsk.* no. 16, repr. 47 pp., 29 figs., 5 pls., 61 refs. Puławy-Bydgoszcz, 1937. (With a Summary in Latin.)

In further investigations on the Ichneumonids of the genus *Pimpla* parasitising *Anthonomus pomorum*, L., on apple in Poland [*cf.* *R.A.E.*, A **15** 13], the author reared from larvae of the weevil three new species, *P. ameformis*, *P. trunctata*, and *P. trilobata*, both sexes of which are described in Latin, as well as *P. pomorum*, Ratz., and *P. nucum*, Ratz., which is distinguished from *P. calobata*, Grav., and other species by characters of the male genitalia. The results of breeding for a number of years have shown that *P. trilobata* is the most abundant parasite of *A. pomorum* in Poland. Near Bydgoszcz, it oviposited in the second half of May on larvae of the host and occasionally on pupae. The egg, larval and pupal stages lasted 2, 6–7 and 5–11 days, respectively, and the first adults appeared at the beginning of June, the period of emergence lasting about 10 days. The egg and larva are described in detail. In captivity, adults kept singly and fed on diluted honey lived for up to 4 weeks; they paired almost immediately on emergence. It is evident that this species must be polyphagous and have several generations a year; its other hosts are not known, but it is believed that they include *Anthophila* (*Simaethis*) *pariana*, Clerck, and *Pontania proxima*, Lep.

These five species of *Pimpla* are of little importance in the control of *A. pomorum*, as the total rate of parasitism by them seldom exceeds 5 per cent.

FRANSEN (J. J.). **Verslag over de onderzoekingen betreffende iepenziekte en iepenspintkevers verricht op het Laboratorium voor Entomologie van de Landbouwhoogeschool te Wageningen gedurende het jaar 1935.** [Report on the Investigations on Elm Disease and Elm Bark-beetles made during 1935 in the Laboratory for Entomology of the Agricultural College at Wageningen.]—*Tijdschr. PlZiekt.* **43** no. 9 pp. 195–217. Wageningen, September 1937.

Further experiments were made in Holland in 1935 on infecting elms with *Ceratostomella ulmi* by means of adults of *Scolytus scolytus*, F., and *S. multistriatus*, Marsh., that had been in contact with its spores [*cf.* *R.A.E.*, A **23** 735]. In some, infection was obtained by this means while injection of the spores failed ; in others, injection produced infection and the beetles did not. These contradictory results are ascribed to weather conditions unfavourable to the beetles.

In a preliminary investigation of the effect of derris on *S. scolytus*, adults shaken up with a powder containing 1 per cent. rotenone for 5 minutes, then blown clean and placed in a chamber at 10°C. [50°F.], were all dead the next day, while only 2 per cent. died of a batch treated in the same way with wheat flour. In another test, disks of felt dusted with derris powder were blown and beaten so as to leave only traces of the powder. Beetles kept between 2 such disks (held 0·4 in. apart by a wire ring) for 15 hours at 10°C. all died, while 95 per cent. of those between disks treated with wheat flour survived.

Summaries are given of papers now in preparation on the preferences shown by the beetles among different kinds of elm and on the use of trap logs. There was little difference in the attraction of *S. scolytus* by the different varieties, except that *Ulmus wilsoniana* was less attractive, and no reliable data were obtained for *S. multistriatus* [*cf.* **23** 736]. Though beetles were less abundant in trap logs in 1935, they were sufficiently numerous to justify the use of such logs. The Braconid parasite, *Coeloides scolyticida*, Wesm., was bred and liberated around Haarlem, and apparently became established.

The summarised results of an investigation on *Hylesinus* (*Pteleobius*) *vittatus*, F., show that it has one generation a year, the larva hibernating in the pupal chamber or in the larval mine. Hibernation in the adult stage occasionally occurs, in mines specially constructed in elm branches about 4 years old. The adults fly in spring and autumn. Neither adults nor larvae in nature seemed infected with *C. ulmi*. As elms are not susceptible to infection in spring and autumn, *P. vittatus* may be regarded as harmless even if the adults are infected.

Various possible reasons are reviewed to account for the fact that elm disease has spread in Europe faster eastwards than northwards, one being that the species of *Scolytus* that attack elm are rare in northern regions. The two Dutch species fly only when the temperature has reached 20°C. [68°F.].

HOCHAPFEL (H.). **Stärkeres Auftreten von** *Phytomyza rufipes* **in Schlesien.** [An Outbreak of *P. rufipes* in Silesia.]—*Anz. Schädlingsk.* **13** no. 9 pp. 114–115, 3 figs. Berlin, September 1937.

In 1935, *Phytomyza rufipes*, Mg., was abundant in cauliflowers in German Silesia, some young plants being infested by 20–25 larvae each. This was probably due to the warm, dry weather in 1934–35, for in 1936, when it was cooler and moister, there were 0–3 larvae per plant examined. In 1935, the mines were in the leaf-stalks or mid-ribs, and the same injury was observed in 1936 in cauliflowers planted early ; in those planted late, larvae were found in the stem [*cf.* *R.A.E.*, A **25** 730]. As has been observed in England [**15** 649], pupation in the ground was the rule, only two pupae being found in the mines. In Silesia, there appear to be only 2 generations a year, the larvae of which occur in May–June and July–August. In 1935, 8 per cent. of the pupae were parasitised by *Dacnusa* (*Rhizarcha*) *areolaris*, Nees, and *D. mucronata*, Tel. The observations made do not show *P. rufipes* to be an important pest in Silesia.

MÜHLOW (J.) & SJÖBERG (K.). **Studier och försök rörande vetemyggorna** *Contarinia tritici* **Kirby och** *Clinodiplosis mosellana* **Géh. samt deras bekämpande. V. Fältförsök för bekämpning av de äggläggande myggorna i vetefälten.** [Studies and Research on the Wheat Gall-midges, *C. tritici* and *Sitodiplosis mosellana*, and their Control. V. Field Experiments on the Control by Chemical Means of ovipositing Midges in Wheat-fields.]—*Medd. Växtskyddsanst.* no. 19, 20 pp., 5 figs., 10 refs. Stockholm, 1937. (With a Summary in German.)

In continuation of work on the control of the wheat gall-midges, *Contarinia tritici*, Kby., and *Sitodiplosis* (*Clinodiplosis*) *mosellana*, Géh., in Sweden [*cf. R.A.E.*, A **25** 69], investigations were made in 1933–36 in Svalöf on the effect of insecticides on ovipositing females in wheat-fields. Applications for this purpose must be made during the comparatively short oviposition period [*cf.* **24** 348] and in the few hours preceding sunset.

No reduction in infestation was observed when plots were dusted heavily with pyrethrum powder or derris, or sprayed with a solution of rotenone, or when paradichlorobenzene crystals were mixed with sand and scattered over the plots.

When plots were sprayed with a solution of pyrethrum extract in kerosene (1 : 30) at the rate of 1 gal. per 100 sq. yds., the percentage of injured ears fell from 16, in the controls, to 7. In 1933, a proprietary miscible pyrethrum extract applied in water at a concentration of 1 per cent. to two plots on successive days at rates of 2 and 1 gal. per 100 sq. yds. reduced the percentage of injured ears from 15 to about 9, and when in the following year only the first application was made, from 5·2 to 4. Sprays of nicotine (0·1 and 0·05 per cent.), applied once at the rate of 1 gal. per 100 sq. yds., reduced the percentage infestation from 8 to 3·7 and 5, respectively. When a solution of paradichlorobenzene in kerosene (1 : 100) was applied at the rate of 2 gals. per 100 sq. yds., damage to the plants was excessive, but application at the rate of 8 pints caused insignificant injury and reduced the percentage infestation from 16 to 9. Kerosene applied alone at the latter rate reduced it to 6, but caused more injury. Tests were made in all three years on water suspensions of paradichlorobenzene. One of 10 per cent. strength applied at the rate of 2 gals. per 100 sq. yds., followed by a second application at half this rate on the following day, reduced infestation from 15·2 to 10 per cent. in 1933. In 1934 the results were doubtful, and in 1935 the populations were too small to afford definite results from an investigation on the effect of spraying in the early afternoon.

Good results in the laboratory were given by various grades of "mint-powder," a proprietary preparation of a phenol derivative and kaolin, and though field tests were made somewhat late, applications at rates of approximately 5–8 lb. per plot of 200 sq. yds. gave about 50 per cent. control. These results, are regarded as justifying further work. Fumigation with arsenic smoke or gas, obtained by burning mixtures of arsenic sulphide or arsenic trioxide with phosphorus and sodium chloride, preferably with the addition of sulphur, did not give good results, as the arsenic collected mostly on the ground and prevented oviposition only during the actual process of fumigation.

[ROTMAN (M. N.).] **Ротман (М. Н.). The Effect of Anabasine on the gaseous Exchange in Insects.** [*In Russian.*]—*Izv. Kurs. prikl. Zool.* **6** no. 3 pp. 2–14, 7 refs. Leningrad, 1936. [Recd. 1937.]

[TARASOVA (K. L.).] **Тарасова (К. Л.). The Effect of Anabasine on the Activity of the Heart in Insects.** [*In Russian.*]—*T.c.* pp. 15–24, 10 refs.

[IVANOVA (P. G.).] **Иванова (П. Г.). The Permeability of the Integument of Insects with Regard to Anabasine.** [*In Russian.*]—*T.c.* pp. 25–32, 10 refs.

Larvae of *Pteronus ribesii*, Scop., after being dipped into a 0·5 per cent. solution of anabasine or a 1 per cent. solution of anabasine sulphate (containing 40 per cent. anabasine), discharged liquid from the mouth and anus and became paralysed in 2–15 minutes. The rate of respiration of larvae dipped in anabasine sulphate first increased strongly, but soon returned to practically the normal level; no increase in the rate was observed in those dipped in basic anabasine. In about 1–3 hours, paralysis of the older larvae passed and the normal respiration rate was restored; younger larvae remained paralysed for 8–12 hours, and some died. It is concluded that the anabasine preparations probably act on the nervous and muscular systems and only in a secondary way on the respiratory system. Similar experiments with larvae of *Pieris brassicae*, L., resulted in a slow decrease in the respiratory rate and a general sluggishness, and death often ensued during moults.

Larvae of *Pteronus ribesii* submerged in a 1 per cent. solution of anabasine sulphate survived for up to 6 hours, whereas they died in a 1 per cent. solution of sodium chloride in about 2 hours. The rate of pulsations of the dorsal vessel in the larvae submerged in the anabasine sulphate solution at first somewhat increased, but became normal in half an hour. When the solution was applied with a brush, the larvae reacted immediately by strong movements and emission of fluid from the mouth and anus; in 7–10 minutes paralysis occurred and the rate of pulsation of the dorsal vessel increased four times as compared to the normal rate. The paralysis continued for a few hours (up to 24), after which the larvae appeared to recover completely. The action of the poison on the pulsations was much less noticeable when the ventral nervous chain was cut, which suggests that anabasine sulphate acts not directly on the circulatory system, but on the nervous and muscular systems. Experiments on the direct application of anabasine sulphate to the dorsal vessels of larvae of *Pieris brassicae* dissected alive showed that even concentrations as low as 0·00001 per cent. result in an immediate and final cessation of its pulsations. This suggests the possibility of using the dorsal vessels of these caterpillars as an indicator for anabasine sulphate. Incidentally, the experiments showed a characteristic difference in the rate of pulsation of larvae parasitised by *Apanteles glomeratus*, L., in which it was 6 per minute, as against 29 in the normal caterpillars. Caterpillars fed on nasturtium leaves had an irregular pulsation rhythm. The action of anabasine sulphate on the dorsal vessel of *Blatta* (*Periplaneta*) *orientalis*, L., was only temporary.

Experiments with dialysers prepared from the integuments of larvae of *Pieris brassicae* and *Pteronus ribesii* showed that the degree of penetration of fluids is variable and depends on such factors as food, season, parasitisation, etc. The chitinous cuticle is penetrated very easily, but the hypodermal layer presents an effective barrier to penetration. Anabasine and anabasine sulphate facilitated penetration of fluids through the integuments, the rate of penetration increasing with the increase in the concentration of the poisons. It is suggested that anabasine acts by narcosis of the hypodermal cells.

[YAKHONTOV (V. V.).] **Яхонтов (В. В.). Results of a Reconnaissance of Forest Pests in the Ak-Tash Section of the Chirchik State Forestry.** [*In Russian.*]—*Social. Sci. Tech.* **4** (1936) no. 12 pp. 122–130. Tashkent, 1937. (With a Summary in English.)

Observations in July 1930 and again in April–October 1935 in a deciduous forest planted about 40 years previously in north-eastern Uzbekistan at altitudes of between 3,600 and 5,100 ft., and covering an area of over 4,300 acres, revealed the presence of a number of pests, chiefly insects. Notes are given on their abundance, the damage caused and the food-plants on which they were taken. A species of *Tetranychus* on *Prunus cerasifera* was the most important of the mites causing mass shedding of the leaves in June. Of the 54 species of insects, the most injurious was *Lymantria* (*Porthetria*) *dispar*, L., which occurred on various trees and especially walnut. Walnut was also attacked by the Noctuid, *Sarrothripus musculanus*, Ersch., larvae of which were found in up to 30 per cent. of the fruits, and by an undescribed species of *Gracilaria*, which curled the edges of the leaves in May and June. *Cydia* (*Carpocapsa*) *pomonella*, L., infested practically all the fruits of apples; and the weevil, *Pholicodes virescens*, Faust, which has not previously been recorded as a pest, was found in September and October 1935 to cause considerable injury to the leaves of almond trees, especially on young plants and on branches growing close to the ground.

PAPERS NOTICED BY TITLE ONLY.

[YAKHONTOV (V. V.).] **Яхонтов (В. В.). A Contribution to the Studies of the Rôle and the Species of Insect Pollinators of the Cotton Plant in Central Asia and the Part played by them.** [*In Russian.*]—*Social. Sci. Tech.* **4** (1936) no. 11 pp. 102–115, 3 refs. Tashkent, 1937. (With a Summary in English.) [*Cf. R.A.E.*, A **25** 528.]

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ROSS (H. H.). **A Generic Classification of the Nearctic Sawflies (Hymenoptera, Symphyta).**—*Illinois biol. Monogr.* **15** no. 2, 173 pp., 17 pls. Urbana, Ill., 23rd July 1937.

MASI (L.). **Descrizione di un nuovo genere di Pteromalini (Hymen. Chalcididae) con note sui generi affini al** *Catolaccus* **Thoms.** [Description of a new Pteromaline Genus (*Heterolaccus*, with type *mauritanus*, sp. n., parasitising *Dicranura vinula*, L., in Morocco) with Notes on the Genera allied to *Catolaccus* Thoms.]—*Festschr. 60. Geburtstage Prof. Dr. Embrik Strand* **3** pp. 368–372. Riga, 11th September 1937.

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